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Development of an Industrial Process

THERE will be found on another page in this issue, a paper by Dr. H. C. Shatwell upon "The production of synthetic motor spirits, with special reference to the Fischer-Tropsch process." It is abundantly clear from a perusal of most of the published matter, Government reports, papers and correspondence, that although a great bulk of scientific literature has been published dealing with the conversion of the gaseous mixture represented by $2H_2 + CO$ into hydrocarbons, the number of people in this country who know anything whatever about the industrial side of the process is extremely limited. It has even been rumoured (though whether the rumour be true, time alone will show) that the Falmouth Committee, whose report has now been completed, finds itself unable to advise definitely that the Fischer-Tropsch process should be adopted because it has not had access to sufficient information. Undoubtedly, the Australian Oil-from-Coal report suffered from the same handicap.

This is distinctly a curious situation, and is very different from the usual attitude of those who desire to sell a process. Probably there are two reasons for this secrecy. The first is that the patentees are getting all they require at the moment from the actual operation of their plant on a huge scale in Germany. The second is that the process is continually being improved, so that to give definite figures of costs and profits might create an impression that would be incorrect a few months later. It is known that there is the greatest difficulty in seeing a Fischer-Tropsch plant in operation in Germany, and possibly that may be for political reasons. There is no definite proof that politics enter into it, however, for arrangements have already been made to install Fischer-Tropsch plants in other parts of the world.

It is exceedingly interesting to review the many chemical and engineering problems that must have arisen in the development of this process. They indicate the diversity of experience necessary in modern research and development work on a major process. The production of methane from carbon monoxide and hydrogen was known and it was the chance observation that liquids could be produced by varying the temperature, pressure or catalyst (or all three) that started Fischer and Tropsch on their work. One of the problems involved a long search to discover the best catalyst and the best method of using it. It was necessary to find a catalyst that retained its activity and that gave the highest yield of liquid hydrocarbons. It was necessary to discover the best temperature and pressure at which to use each of the catalysts tried. The volume of work required can be imagined.

All satisfactory catalysts found are unfortunately poisoned by sulphur and it was necessary to remove the sulphur compounds from the gases down to 0.1 grain per 100 cu. ft. When it is realised that the gas industry throughout the world has desired to find a process which will do this, for at least 25 years, and has not done so, the magnitude of this section of the research becomes evident. It was, moreover, necessary to produce a gaseous mixture that possessed the volume composition $2H_2 + CO$. Water gas is approximately $H_2 + CO$, so that another problem was to discover economic means of enriching blue water gas. Dr. Shatwell mentions several of these, and perhaps the most interesting from the British point of view will be the balanced production of coke and gas from a by-product coking plant. Quite evidently, however, this method, simple as it may appear on paper, must have occupied a good deal of time in discovering how best to convert so difficult a substance as methane into hydrogen and carbon monoxide.

We reach the stage, then, at which the inventors have discovered how to produce a reaction gas of the proper composition, free from sulphur, and they have discovered the best catalyst to use and the conditions under which it is to be used. The next problem was clearly the maintenance of these conditions and to maintain the temperature accurately was an engineering problem of no small magnitude, because during the reaction for each 1 cu. m. of gas converted, no less than 600 Kg. Cals. are liberated—sufficient to raise the temperature of the reacting gases by many hundreds of degrees C. Dr. Shatwell records some of the methods that have been used for the purpose, Dr. Fischer's being the circulation of oil.

The working up of the products introduced more problems, but the greatest of them has been that of the production of lubricating oil from the olefines contained in the gases. It is claimed that lubricating oils have been produced superior to those manufactured from petroleum. There yet remained to be solved problems connected with the purity of the products, with their commercial characteristics and the usual engineering problems consequent upon the erection of large-scale units. The economic aspect of the process had to be given the closest attention in the light of the hydrogenation and of petroleum products. A process of this far-reaching character can hardly develop without the meddling of the politician. It can be appreciated from this rapid, bird's-eye survey, what an immense train of chemical, engineering, economic and political work has been set in motion from the almost chance observation of Professor Fischer and his colleagues that the Sabatier-Senderens reaction at lower temperatures would yield alcohols and at lower pressures, and with very active catalysts, would yield hydrocarbons.

Notes and Comments

Confidence in the Future of Trade

THE attitude which THE CHEMICAL AGE has taken in the last few weeks towards the talk of a trade slump was amply vindicated early this week by one of the most distinguished financiers in the country. Mr. McKenna, a former Chancellor of the Exchequer and now Chairman of the Midland Bank, said to the members of the National Union of Manufacturers at Birmingham that there was no ground for the belief that British trade was on a downward curve, and there was no reason for it to occur now. He attributed part of the current fears to Stock Exchange-minded folk who grew depressed when they saw the industrial trend in the United States. He pointed out that whereas nothing similar to American conditions prevailed in this country, there was no need to anticipate a similar decline here. He dismissed the trade cycle talk as a bogey, and put his hearers right on the question of armaments. He admitted that the expenditure on the rearmament programme was important to particular cities and industries, but contended that, compared with the total volume of our trade, it was comparatively insignificant. Finally, he gave a pointed reminder of the fact that the growth of British industries in recent years had been sufficient to absorb the decline in the country's foreign trade. It is difficult to see how scaremongering, even for political ends, could go on much longer in the face of facts and figures such as Mr. McKenna was able to adduce. A little more confidence such as men of his weight are in a position to stimulate, and the turn of the year will see the discomfiture of the croakers.

Planning Industrial Development

SPEAKING at Manchester on Tuesday, Col. K. C. Appleyard, chairman of North-Eastern Trading Estates, Ltd., urged a reasoned plan of the location of industry, evolved by the Government or by industry in concert with the Government. Inducements must be offered to occupy areas where industry is scarce or ill-balanced, and the plan must be publicised. Some of these inducements are now available, and by adopting the methods used in the Government-fostered Team Valley Trading Estate, Col. Appleyard said that he was confident that industry can be persuaded to go to the industrial zone required and prepared for it. The big industries have realised the advantage of planning, he pointed out that surely the time is ripe to embrace the host of small unorganised industries in a national plan of production and location.

Jubilee of Queen Mary College

A BANQUET was given by the Drapers' Company on Wednesday to celebrate the 50th anniversary of the foundation of Queen Mary College. The college has an interesting history and, in view of the part it has played in chemical education, a short account of it would not be out of place. The college itself sprung from the evening classes associated with the People's Palace when it was built half a century ago. After a few years the People's Palace found itself in difficulties, and in 1892 the Charity Commissioners devised a scheme to run it, the Drapers' Company contributing a large annual grant. The People's Palace technical classes then became East London Technical College recognised in 1907 by the University of London as a school of the University in the faculties of arts, science and engineering. A little later the name was changed to East London College. In 1913 the Charity Commissioners and the Board of Education planned to separate the administration of the People's Palace and the College as recreative and educational centres respectively. Six years ago the College was finally separated from the Palace and the Drapers' Company received for it a large piece of ground from the Palace. In 1934 Queen Mary presented to the College a Royal Charter of Incorporation upon which it entered into possession of the ground and buildings formerly belonging to the People's Palace. The College then took its present name. In the three years since 1934 the work of remodelling the old buildings and developing the new part has been going on. Among the main developments made in the interval are a new chemistry laboratory and a new high-voltage laboratory for investigating potentials of over 1,000,000 volts, and containing a cathode-ray oscillograph. In a tour of the chemical laboratories made last Monday, some of the research problems being investigated were described. It was remarkable, and satisfactory, to note how many of these problems would probably have a direct practical bearing in industry.

Psychology Applied to Industry

INVESTIGATIONS in factories directed towards increasing effective capacity and reducing costs, the elimination of waste of time, effort and material, and the increase of smoothness, efficiency and satisfaction of work, can only result in benefit both to the employer and the employee. Such investigations do not necessarily give rise to a gain in output or increased production, but they tend to remove all obstacles, physical and mental, which prevent the worker from doing his best. Broadly speaking, this is one of the aims of the National Institute of Industrial Psychology. The seventeenth annual report of the Institute states that thirty-four investigations in factories and offices have been conducted, a slight increase over the number in the previous year, and an account of these investigations carried out in various industries, including the chemical, is given. As an example, a firm of chemical manufacturers was paid a short visit and a general report made on labour management, working conditions, and staff welfare. Constructive, practical advice on the improvement of these industrial factors is well worth obtaining.

Sugar Reduction by Electrolysis

THE hexahydric alcohols formed by the reduction of sugar have only been available on a commercial scale for a comparatively short time, but it is already known that they possess properties which indicate valuable uses in industry. Killeffer in the current News Edition of Industrial and Engineering Chemistry describes the commercial reduction of sugar by electrolytic means, a method, it is thought, which may mark the commencement of a new technique in organic synthesis. It is essential that the raw material, dextrose, be pure. It is dissolved in distilled water and acid and base added so as to form the salt, preferably sodium sulphate, required to effect enolisation and impart conductivity. It is passed into the electrolytic cells, fitted with lead sheet electrodes, the reduction taking place in stages. The reduced solution is evaporated, treated with hot alcohol, and filtered. The hot filtrate is cooled to crystallise out the mannitol and the mother liquor is evaporated to recover the sorbitol. Details of the method are furnished in the account.

The Production of Synthetic Motor Spirits

Review of Technical Processes Utilised with Special Reference to the Fischer-Tropsch Method

THE possibility of producing motor fuels on the industrial scale by methods of synthesis continues to attract attention in those countries which lack underground stores of oil but possess extensive deposits of coal or other bituminous materials, said Dr. H. G. Shatwell at the commencement of his paper on " The Production of Synthetic Motor Spirits with special reference to the Fischer-Tropsch Process," read before the North-Western Section of the Institute of Fuel, at Manchester, on December 7. James Young had found as early as 1867 that substantial yields of light oils could be produced by distilling petroleum under pressure. This process, modified in a few details, ultimately became the basis of an enormous industry which has been responsible for the conservation of huge quantities of crude oil.

Cracking

Ever since its inception, " cracking " has encountered many difficulties, most of which have been solved by the application of chemical engineering principles. Twenty years ago, the average cracking plant operated intermittently, and was capable of producing about 30 per cent. of gasoline of low octane rating from a maximum of 80 tons of oil per day; the modern unit can handle continuously upwards of 4,000 tons of crude oil in 24 hours, making about 65 per cent. of high anti-knock spirit. Further, uninterrupted runs of 100 days are not now uncommon, whereas only 10 years ago a five-day cycle was considered to be quite an achievement. These improvements have been rendered possible by the study of such questions as heat exchange, the flow of fluids through pipes, the design of hot oil pumps and fractionating towers, and by the successful search for metals and alloys required to withstand the effects of corrosion and erosion at high operating temperatures and pressures. Careful attention to the design of furnaces and to the rate of flow of oil through the various coil sections has undoubtedly been responsible for the ability to maintain a plant on stream by reducing coke deposition to an almost negligible amount.

The search for high anti-knock fuels, intensified during the last few years, has now opened a new chapter in the history of cracking. It is now known that by carefully controlled thermal decomposition, the gaseous paraffins, excepting possibly methane, can be converted to olefines which, in turn, can be made to yield substantial quantities of liquid hydrocarbons distilling in the motor spirit range. Several processes have been studied in detail, and applied commercially, with considerable success, to the gaseous products of oil cracking.

Wagner (1) has described the method developed by the Pure Oil Co. Cracked gases containing large proportions of olefines were heated to 510° C. at a pressure of about 50 atm. to produce 1.5 gal. of gasoline from 1,000 cu. ft. of gas. The yield was increased to 2.5 gals. by recycling the gas remaining after condensing the polymers, and this was subsequently raised to 2.71 gals in a commercial unit. Another method of polymerisation worked out for Universal Oil Products by Egloff, Ipatiev and Corson (2) employs phosphoric acid on kieselguhr as the catalyst. In a typical experiment, cracked gas containing 47 per cent. of olefines was passed over the catalyst at 232° C. and 200 lb. per sq. in pressure to give 3.2 gal. of liquid polymers, or almost 3.0 gal. of motor spirit per 1,000 cu. ft. of gas. The yield of liquid polymers, which consist largely of mono-olefines, depends upon the olefine content of the gas used for the conversion, and may amount to 12 gal. per 1,000 cu. ft. The octane rating of the polymer gasoline varies between 80 and 85, whilst its blending value is higher than that of benzene or iso-octane.

If the C_4 content of the initial gas is isolated and treated separately, even with sulphuric acid as the catalyst, it is possible to produce a polymer which, on hydrogenation, gives iso-octane with an octane rating of 100. Developments on these lines are taking place quite rapidly, and increasing supplies of super-grade motor spirits are coming forward at prices which are not unreasonable.

Finally, by pyrolysing gaseous hydrocarbons at atmospheric pressure and at temperatures of 750° to 1,000° C., it has been shown that a wide range of aromatic hydrocarbons can be produced. (3 4) The yield of liquid products varies from 0.44 gal. in the case of methane, to 4.6 gal. per 1,000 cu. ft. in the case of butanes. The composition of the product depends upon the conditions employed, but it is possible to manufacture substantial yields of motor benzole containing 75 per cent. of benzene. The significance of these discoveries is considerable in view of the enormous output of natural and refinery gases and having regard to the importance of benzene and toluene as blending agents for the preparation of high anti-knock spirits.

Turning to methods of synthesis from materials other than petroleum, it is clear that coal offers the only possibility, at least in this country. Three distinct processes have been proposed and two have been developed commercially.

Low Temperature Carbonisation

The quantities of crude spirit produced by carbonising coal at low temperatures are relatively insignificant, representing only 0.07 per cent. of the total consumed annually in Great Britain and Northern Ireland. Nevertheless, the yield per ton of coal has increased from 2.16 gal. in 1932 to 2.93 gal. in 1935, whilst the total outputs for the same years were 430,000 and 878,000 gal. respectively, an increase of slightly over 100 per cent. in four years.(5)

Coal spirits possess a characteristic odour, and usually require somewhat more drastic refining than petroleum spirits. Most of the sulphur, which occurs in the form of mercaptans, can be eliminated by well-known chemical methods, but the gum-forming constituents are sometimes more intractable. Bristow (6) has described a typical coal spirit which is being manufactured in large quantities by the Coalite process and is finding a ready market. Its high octane rating of 86 to 92 renders it of particular value for use in high compression engines or for blending with other petrols.

Although methods of low temperature carbonisation do not aim at making motor spirits except as by-products, they may exert an appreciable effect upon supplies as time goes on and experience develops. The production of petrol can be increased by recycling the heavier coal oils through the retorts, but of greater significance is the fact that low temperature tar is easily and completely transformed to motor spirit by hydrogenation under pressure.

Destructive Hydrogenation

At the coal hydrogenation plant of Imperial Chemical Industries at Billingham, the process consists in pasting pulverised, washed coal with an equal weight of heavy coal oil, adding a small amount of catalyst, and treating the mixture with hydrogen at a pressure of 200 atm. and temperatures of the order of 450° to 480° C. The raw material first passes through preheaters in counter current to the hot products leaving the plant, and thence through a number of vertical converters in series. The vapours are then separated from the residual oil, which contains ash and a small amount of unconverted coal, and which is centrifuged to remove the solids. The oil so recovered is used to prepare fresh coal paste, the solid residue being disposed of as fuel for steam raising. The vapours leaving the converters, after passage through heat exchangers, are condensed and then distilled to recover the petrol, the residue of distillation being re-treated

in the vapour phase in presence of a fixed catalyst. The unconsumed hydrogen, after washing, is returned to process.

The catalysts employed have varied from time to time in attempts not only to increase the throughput, but to produce oils of different grades. The salts, sulphides and oxides of molybdenum, tungsten, manganese, etc., have proved to be most effective catalysts, but according to Dr. Shatwell, certain salts of cobalt have most pronounced effects. Latterly, organic salts of tin, in conjunction with free hydrochloric acid, have been used in the Billingham plant, though corrosion of certain parts of the equipment might be expected to be severe.

It is now possible so to vary the conditions of operation that oils of various types may be manufactured at will. Lubricants, however, have not so far been produced. An excellent account of the installation was given by Gordon,(7) who states that the yield of petrol from coal, on an ash-and-water free basis, exceeds 60 per cent., whilst that from tar and tar oils is from 80 per cent. to 90 per cent. by weight. During 1936, 100,000 tons of coal and an unspecified quantity of low temperature tar and creosote were treated to produce 112,000 tons of spirit, the whole of which was absorbed by the oil companies' distributing organisations.(9) Although the installation at Leuna has more than thrice the capacity of the Billingham plant, the former deals mainly with brown coal, which is much more easily hydrogenated.

These large-scale developments, which have grown from the original discoveries of Berthelot in 1869 (10) and of Bergius in 1914,(11) have initiated a technique which is yet in its infancy, and which may have a profound influence not only upon chemical technology but upon the economic policy of those countries which are non-producers of crude petroleum.

The Fischer-Tropsch Process

A third process for the production of oil from coal, and one which is quite revolutionary in its conception—the Fischer-Tropsch process—is attracting a great deal of attention.

In their early researches, Fischer and Tropsch (12) found that if water gas, freed from sulphur, is passed over an alkali-iron catalyst at 450° C. and a pressure of 150 atm., an oily product consisting of alcohols, aldehydes, ketones, fatty acids and small proportions of hydrocarbons is formed. This material, known as "Synthol," was shown to be a useful motor spirit, but was rendered more valuable by cracking, when it became converted in large yield to hydrocarbons, called "Synthene."

Later researches elucidated the fact that by operating at lower temperatures and pressures in presence of hydrogenating catalysts, the oxygen content of the oily product could be eliminated, leaving hydrocarbons and water as the only reaction products.(13) Their first paper (14) disclosed that 100 c.c. of liquid and solid hydrocarbons could be formed by repeatedly circulating one cubic metre of water gas, rigorously purified from sulphur, over an iron-copper catalyst at about 270° C. and atmospheric pressure. Finely divided iron, nickel and cobalt, alone or in conjunction with the oxides of chromium, zinc and beryllium, were found to be efficient catalysts, though cobalt was superior to iron, and nickel gave large yields of methane. The reaction was subsequently investigated most thoroughly, and improvements made in methods of preparing a feed gas of the required composition, in freeing the gas from impurities, and in finding catalysts of considerable activity capable of retaining that activity for several months.

Preparation of Synthesis Gas

According to Aicher, Myddleton and Walker, (15) who have been responsible for developing the Robinson Bindley process in this country, the reaction may be regarded as $9CO + 18H_2O = (CH_2)_9 + 9H_2O$, as the average molecular weight of the oil produced is approximately that of nonane. Consequently, since the interaction of steam and coke produces a gas containing hydrogen and carbide monoxide in equal proportions, it is necessary to enrich blue water gas with half its volume of hydrogen. Fischer, Pichler and Kolbel (16) propose to obtain the necessary supply of hydrogen by passing a mixture of steam and coke-oven gas through the incandescent coke bed of a generator whereby the methane in the gas reacts with steam according to $CH_4 + H_2O = CO + 3H_2$. They state that a gas containing 27.6 per cent. CO and 64 per cent. H_2 can be produced by adopting relatively long air blowing and gasifying periods, *i.e.*, 3 and 9 min., respectively. An average debenzolised coke-oven gas contains 7.5 per cent. CO, 54 per cent. H_2 and 28 per cent. CH_4, and a simple calculation shows that for every 100 volumes of blue water gas made by the interaction of steam and coke, approximately 70 volumes of coke-oven gas must be passed through the generator to give a total of 220 volumes of synthesis gas.

In a previous paper, Fischer and Tropsch (17) had stated that it is not possible to decompose methane completely by contacting it with coke at 1,000° C., even with a large excess of water vapour and a slow passage of the gas. The difficulty now appears to have been solved in a method protected by the Koppers Co., who are the sole agents in England for the Fischer-Tropsch process. According to this scheme,(18) the gases generated during the blow period are led through a preheater constructed of brick checkerwork, which becomes strongly heated. Then, in the make period, the mixture of steam and coke-oven gas traverses the preheater on its way to the generator, so that a large proportion of the methane is decomposed before it reaches the bed of coke.

This system of gas generation is ingenious because it utilises large quantities of the coke-oven gas produced in the manufacture of the coke from which water gas is made. The maintenance of an economic balance between the coke, coke-oven gas and water gas, however, is a matter requiring very careful computation.

Purification of Synthesis Gas

In order to preserve the hydrogenating catalyst, the sulphur content of the reaction gas must be reduced to a maximum of 2 mgm. per cu. m., or approximately one grain per 1,000 cu. ft. Hydrogen sulphide can be eliminated, of course, by an iron oxide box, but organically combined sulphur requires special treatment. Using a catalyst consisting of equal parts of lead chromate and copper oxide (19) at 300° to 500° C., or finely divided silver (20) at 200° to 300° C., the sulphur compounds are converted to hydrogen sulphide. It has been observed, however, especially at the higher temperature, that interaction occurs between the H_2S so formed and the CO in the gas to produce CS_2 and COS. Roelen (21) has found that this tendency can be checked by shock cooling the gas by direct contact with cold water immediately it leaves the catalyst.

Another method of desulphurisation, due to Studien and Verwertungs G.m.b.H., (22) consists in the use of iron oxide to which not less than 10 per cent. of alkali carbonate is added. This mixture is active between 200° and 300° C., and is capable of decomposing the organic sulphur compounds and retaining the sulphur so formed. The employment of alkaline potassium ferricyanide solutions to extract H_2S from industrial gases has been described by Fischer and Dilthey.(23) The reaction is as follows:—

$$2K_3FeCN_6 + H_2S + 2KOH = 2K_4FeCN_6 + S + 2H_2O.$$

The loss of free sulphur which occurs through secondary reactions can be prevented by the use of solutions containing one mol of sodium carbonate and two of bicarbonate to one mol of ferricyanide. Further, the ferrocyanide solution formed as an end product can be restored to its original condition by anodic oxidation.

Hydrogenating Catalysts

Most of the researches concerned with the manufacture and purification of the synthesis gas have been carried out by Fischer and his collaborators, but in the realm of actual conversion to oil many other investigators have been active. From the mass of published results, it appears that iron, cobalt

and nickel, promoted by other metals and oxides, give the best results. In general, it is agreed that iron is the most sluggish, but can be used over a longer temperature range, that cobalt yields a product containing substantial proportions of olefines, and that nickel is extremely active, but tends to produce methane and liquid and solid hydrocarbons which are almost entirely paraffinoid in nature. Precipitated catalysts are superior to those prepared by heating the nitrates, carbonates, etc. Fischer ([24]) obtained yields respectively of 100 c.c. and 50 c.c. from one cu. m. of gas with cobalt-copper and manganese-iron-copper catalysts, both of which remained active for some months, but had then to be regenerated chemically. Later, ([25]) nickel mixed with 18 per cent. of thoria on kieselguhr was found to give 120 c.c. of liquid hydrocarbons by one passage of the gas at 178° C., though its activity diminished by 17 per cent. after five weeks' uninterrupted use; the thoria, also, could be replaced by manganese.

Progress continued to be made in evolving more active and more stable catalysts, and in 1932 Fischer and Koch ([26]) recorded the results obtained with cobalt-thoria (18 per cent.) deposited as the carbonates on kieselguhr, and with cobalt-manganese (15 per cent.). The former gave a yield of 153 c.c. of liquids per cu. m. of gas (26 to 28 per cent. CO : 55 to 58 per cent. H_2), corresponding to a 71 per cent. conversion of the carbon monoxide. Also, its activity diminished by only 10 per cent. after nine weeks and was completely restored by removal of the wax which had been deposited thereon. The cobalt-manganese catalyst was equally active and when promoted with copper, possessed the advantage that its temperature of reduction corresponded with the reaction temperature of the gas, thus obviating the necessity of reducing at a high temperature. Fujimura and Tsuneoka ([27]) have studied the effects of various promoters on nickel and cobalt. A catalyst consisting of Co8 : Cu1 : Tho.2 and Uo.1, prepared by adding starch to the mixed nitrates and heating, gave 145 c.c. of oil per cub. metre of gas by one pass at 210° C. Nickel, promoted with thoria or urania, is even better, and operates at 190° to 200° C. Again Kita ([28]) reports a yield of 166 c.c. by the use of a nickel-cobalt catalyst containing manganese, thoria and urania.

In this country, Aicher, Myddleton and Walker ([15]) employed nickel-manganese-aluminium deposited on kieselguhr and made into granules with ethyl-orthosilicate, the yield of oil being 130 c.c. per cu. m. This was increased to 150 c.c. by a second treatment of the unconverted gas, and to 170 c.c. in a three-stage operation. Fischer and Pichler, ([29]) using a similar method of recycling, obtained 141 grams of oil as against a theoretically possible yield of 185 grams, or a return of 76 per cent. As far as can be ascertained no positive results with sulphur-tolerant substances like molybdenum and tungsten have yet been recorded. Meyer and Horn, ([30]) however, have found that carbon monoxide cannot be reduced with molybdenum at atmospheric pressure, but that it is converted to methane at 400° C. and 100 atmospheres pressure.

Hydrogenating Conditions

The conditions for successful conversion are closely defined. Firstly, the pressure must not greatly exceed atmospheric, otherwise alcohols and other oxygen-containing bodies begin to appear in the product. Secondly, the temperature must be accurately controlled at around 190° to 200° C. for nickel, 200° to 210° C. for cobalt, and not above 250° C. for iron-base catalysts. Any appreciable rise beyond these temperature limits leads to the production of methane. Thirdly, the time of contact based upon the rate of feed of synthesis gas to give maximum conversion is of the order of 45 to 50 seconds. This factor is of fundamental importance since it determines the capacity of the hydrogenating tubes.

The reaction is exothermic, the quantity of heat liberated being 600 kg. calories per cu. m. of feed gas, equal to 20 per cent. of the total heat of combustion; its immediate removal from the sphere of action is essential to prevent overheating of the catalyst and the production of large quantities of methane. Solid hydrocarbons produced during the conversion are adsorbed to an appreciable extent by the catalyst, and it is necessary to interrupt the process at intervals in order to extract the wax by means of light petroleum. This difficulty, however, is slight in comparison with that concerned with the removal of the heat of reaction and the maintenance of a constant catalyst temperature. Special types of reaction chambers with restricted depths of catalyst are required.

Properties of Reaction Products

The products of the reaction of carbon monoxide in presence of the catalysts described consist of gaseous, liquid and solid hydrocarbons, which are essentially of a paraffinoid type with probably few branched chains. Cobalt-base catalysts tend to yield a greater proportion of olefines, and this tendency can be increased in all cases by reducing the H_2 : CO ratio of the synthesis gas. According to Martin, ([31]) the products can be separated into the following fractions :—Gases (Gasol), 8 per cent.; spirit to 200 C. (Kogasin I), 60 per cent.; diesel oil (Kogasin II), 22 per cent.; solid paraffins, 10 per cent.

In their earlier work, Fischer and Tropsch ([14]) examined the benzine which was extracted from the finished gases with charcoal, the crude condensate, and the wax after recrystallisation from acetone. The bulked product is free from sulphur and gums and contains only traces of aromatic hydrocarbons, whilst lubricating oil fractions, as well as asphalt, are completely absent. The motor spirit fraction is produced in the greatest yield. Owing, however, to its predominantly paraffin structure, it possesses a low octane rating and must be blended with benzole or tetra-ethyl-lead to bring its requirements on this account to the level of an average motor spirit. The diesel oil, though produced in relatively smaller quantities, possesses a cetene number of 100, and can be blended with inferior diesel oils, such as tar oils, in large proportions. The gasol is suitable for conversion to high anti-knock spirits by the methods of pyrolysis and polymerisation described in the first part of this paper. The total liquid and solid product can be cracked, if desired. Egloff, Nelson and Morrell ([32]) subjected the topped oil to conditions of selective cracking and polymerised the olefines present in the gas to obtain an overall yield of 84 per cent. of a 66 octane number spirit.

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Research on New Uses for Lac

Expansion in Synthetic Resin Industry Necessitates Reliability in Purity and Uniformity of Natural Product

THERE has been no cessation in the expansion of the synthetic resin industry states the annual report of the London Shellac Research Bureau for 1936-37. In 1935, the estimated world production of synthetic resins was 160,000 tons; since then, though the actual world statistics are not yet available, there has been considerable expansion, Germany more especially forging ahead. While the tonnage has increased, prices have gone down from an average of Rm. 4 per kg. in 1929, to a little over Rm. 2 in 1935 (wholesale prices, ex-factory).

American Synthetic Resin Production

The United States lead in production, with Germany second and Great Britain third. France, Belgium, Italy, Austria and Soviet Russia are all expanding their synthetic resin industries. In 1936, the United States of America used the following raw materials to make up some 110 million lb. of unfilled resins for the moulding industries:—Alcohol, 4.4; phenol, 36.0; urea, 2.1; formaldehyde, 38.0; sulphuric acid (100 per cent.), 11.9; nitric acid (100 per cent.), 21.5 million lb. This production of 110 million lb. of resins was made up approximately of the following, for plastics production (unfilled):—Cast phenolic resins, 5.6; other phenolic resins, 30.8. xylenol resins, 0.25; maleic acid, sulphonamide, styrol and cresol resins, 3.6; urea resins, 6.2; cellulose acetate, 10.75; cellulose nitrate, 19.4; phthalic anhydride (glyptal) resins, 34.3 million lb.

The prices and uses of some of these resins are of interest. Thus cast phenolic resins find their use in such materials as buttons (40 lb. per cent.) and adhesives for laminated goods (8 per cent.), while the average price per lb. appears to be 44 cents. (1s. 10d.). Urea resins, again, find a use in buttons, lighting fixtures, housings for scales, radio sets, etc., and are a little cheaper at 35 cents. per lb. (1s. 5½d.). The glyptal resins go mostly into paints and finishes, the price is not accurately known, but is fairly high. Injection mouldings, motor car finishes and moulded parts use cellulose acetate, marketed at 40 cents. per lb. (1s. 8d.). Cellulose nitrate is largely used in finishes at a price approximating that of cellulose acetate. The most expensive cellulose derivatives are benzyl and ethyl cellulose at 1.15 and 0.85 per lb. (4s. 9½d and 3s. 6½d.).

Among other newcomers the vinyl resins, with a production of 2 million lb. in the United States can be cited, with extensive uses for tin lacquers, dentures, coating paper and screw caps, selling at 50 cents. per lb. (2s. 1d.).

Two Deductions

As the result of a study of these figures two observations of general interest to those engaged in the natural resin field may be made. First, that the prices of many of the synthetic resins are still high and likely to keep high; secondly, that the demand for cellulose, both as a primary raw material and as a filler, as wood flour to the extent of 40 per cent. in moulded goods, is likely to exceed the supply, or, at the best, force up prices, especially in Europe where the supplies of wood (softwoods principally) are limited. It is also worth observing that in the natural resin field chemical research in recent years, more especially evidenced in the rosin, copal and lac industries, has been developing new uses for its products and improving old ones. It is undeniable that impetus to these developments has been given by the policy and technique already adopted by the synthetic resin manufacturers.

It is quite clear that the future of the natural resins depends largely on the wide acceptance of the rapidly emerging truth that they must be looked upon as the starting point for chemical processing and that chemical industries engaged in this processing must be able to rely on the purity and uniformity of their raw materials. Lac is no exception and consequently standard qualities and steady prices are the foundation stones on which the permanent well-being of this ancient Indian industry has to be built up. But whereas the synthetic resin chemist relies largely on his ability to combine his comparatively simple raw materials in various ways in order to create new products of use to-day, the lac chemist (and the research worker in the rosin, copal, etc. field as well) has to rely more on the intelligent breaking-down of the very complex natural resin he is handling—a breaking-down based on an accurate knowledge of the constitution of the resin in question—in order to achieve similar results. Hence, the necessity for lacs of guaranteed purity and performance and, further, the need of buying specifications to ensure their supply.

Recent Lac Research

At the Paint Research Station, Teddington, and at University College, London, lac research was continued according to the sanctioned research programme given in last year's report. Dr. Bhattacharya continued his studies on the constitution of lac and confirmed the existence of Nagel's shellolic acid (*Chem and Ind.*, 1936, *55*, 309). Considerable *ad hoc* work was done, including the proofing of jute fabric with modified lac compounds, preparing bituminous surfaces for painting with light colours by using undercoats of shellac varnishes, preparing bottom finishes for shoes using a lac base and making photographic anti-halation backing compositions, with lac as an ingredient. The use of lac in abrasive wheels was also the subject of study.

An interesting development in the making of hard lac resin has been the development of a process of extraction of whole lac with aqueous "buffer" solutions (*Chem. and Ind.*, 1937, *56*, 666). This is a cheap method and the Metropolitan-Vickers Electrical Co., Ltd. are testing a large sample of the resin for its electrical properties.

At the research laboratory of the British Thomson-Houston Co., Ltd., Dr. Karim continued his work on the chemistry of lac by a study of the individual lac components, derived from the groups of constituents obtained by selective solvent extraction, and also on the mechanical and electrical properties of lac. This work is also being carried out in America, while electrical testing is also being done in Italy and Germany as part of the programme of the Information Electrotechnical Commission's Advisory Committee No. 15—Shellac.

At the research laboratories of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, preliminary trials of trichlorethylene-extracted hard lac resin were sufficiently encouraging to justify further work within the scope of the programme:—(i) The development of hard lac resin as a bonder for shellac paper tubes; (ii) as a dry bonder for micanite sheet; (iii) as a bonder for micafolium; (iv) for improving insulating varnishes, possibly with certain plasticisers; (v) coating of thin metal foils for use on condenser bushings and the food packing industry; (vi) comparative measurements of the electrical characteristics of specially manufactured lac resins; (vii) purification of the lac residue from hard lac resin manufacture by steam distillation and the application of the product or products produced; and (viii) production of jute-lac wallboards, etc.

Tests on moulding powders supplied by the director of the Indian Lac Research Institute have given good results at the Metropolitan-Vickers Electrical Co., Ltd.'s laboratories (an acetone-extracted-urea treated Hard Lac Resin) and in injection mouldings at Eckert and Ziegler's works near Cologne, Germany (a high flow shellac-wood flour moulding powder).

Letter to the Editor

Production of Oil from Coal

SIR,—In your issue of November 27, on page 433, you report a speech by Mr. Edwards in which he mentions that I gave evidence before the Falmouth Committee on the production of oil from coal.

Mr. Edwards states that the process with which I am concerned does not produce oil from coal, and that the process is not intended to produce oil from coal. This, of course, is a mistake. We have already made and sold over 200,000 tons of petrol and oil from coal, and are rapidly expanding our output and refinery resources.

I would also like to add that I did not give evidence before the Committee in my capacity as Chairman of Low Temperature Carbonisation, Ltd., but as President of the Low Temperature Coal Distillers Association of Great Britain, and I was accompanied by various members of the Council of that Association, who are identified with various processes.

I may add that the whole of the proved processes of this country are represented in that Association, and the Committee took great pains to hear the evidence of all the parties represented.

It would be rather interesting to have some particulars of this marvellous process that Mr. Edwards has up his sleeve; the name of the process, tonnage of coal that had been treated, the nature of the products, and some particulars as to the profit and loss account of the company referred to.

It is hardly fair to stand up in Parliament and adversely criticise everybody and everything, whilst allowing the process for whom he appears to be speaking to remain anonymous. —Yours faithfully,

W. A. BRISTOW,
Managing Director,
Low Temperature Carbonisation, Ltd.

London, December 7.

Activated Carbon Manufacture

A New Factory for South Wales

A FACTORY for the manufacture of activated carbon is to be built on the Treforest Trading Estate, South Wales, for British Activon Industries, Ltd. Production will commence early in 1938, using a special process developed by Professor C. L. Mantell. Activated carbon for gas masks, as well as commercial and industrial purposes, will be made. Large quantities of activated carbon are imported into the United Kingdom, and it is hoped to secure the industry for the Special Area of South Wales. Activated carbon is now used in about 200 industries, typical instances being the whitening of sugar, purifying of all types of oil, recovery of volatile solvents, and the deodorising and decolorising of spirit. Work will be found for between 100 and 200 unemployed persons when the new factory is in production.

AN improved method for the purification of nitrogenous bases derived from the distillation of petroleum is described by Mahan and Bailey (*J.Am.C.S.*, 1937, *59*, 2,449-2,450). The base is heated with zinc chloride at 80° C. for a sufficient time (usually about one hour) to ensure complete formation of the double compound: $(base)_2ZnCl_2$. If a compound of the type $(base\ .HCl)_2ZnCl_2$ is formed, sufficient sodium hydroxide must be added to the solution to neutralise all the hydrochloric acid, and precipitate a little $Zn(OH)_2$ as an indicator of the end-point. The double compound precipitates on cooling, and is separated from the water and hydrocarbon impurities by distillation; it is then heated above its decomposition temperature of about 320° C., and the base, or mixture of bases distilled over in a pure condition.

The method gave very good results in the purification of commercial pyridine, and in the recovery of bases from petroleum residues.

Society of Public Analysts

Election to Membership

AN ordinary meeting of the Society of Public Analysts and Other Analytical Chemists was held at the Chemical Society's Rooms at Burlington House on December 1, the president, Dr. G. Roche Lynch, in the chair.

The following were elected members of the society:—H. F. Bamford, C. R. Bond, F. A. Dawson, John Hawthorne, G. Moses, M. Robinson, J. L. Wilson.

Certificates were read in favour of the following candidates for membership:—J. E. Byles, W. M. Dowson, J. F. Hirst, T. W. Jackson, R. L. Kenny, A. J. Lindsey, F. A. Lyne, C. B. Moon, J. W. Tullo, and J. N. Vickers.

Determination of *p*-Hydroxybenzoic Acid

The detection and determination of *p*-hydroxybenzoic acid in the presence of salicylic acid was the subject of a joint paper by S. G. Stevenson, M.Sc., B.Pharm, F.I.C., and J. Resuggan. Para-hydroxybenzoic acid couples with a solution of benzene diazonium chloride to give a mixture of compounds which are insoluble in alkali carbonates, whereas the corresponding compound from salicylic acid is soluble. An ethereal solution of the azo compound from the para-acid exhibits a red colour when in contact with caustic alkali, and the colour is destroyed by acids. This can be made the basis of a qualitative test, but attempts to make the test a quantitative one have so far failed, because the amounts of the three possible azo compounds formed in the reaction mixture are not in constant proportions.

Contamination of Whale Oil

In a paper on the contamination of whale oil with fuel oil, E. R. Bolton, M.I. Chem.E., F.I.C., and K. A. Williams, B.Sc., F.I.C., described how recent advances in the production of whale oil, and the use of fuel oil in the ships concerned, have led occasionally to the contamination of the whale oil with traces of fuel oil of the order of 0.01 per cent. in spite of all precautions. They described in detail the method finally adopted for the detection and estimation of these traces. It ensures the complete removal from the whale oil of all but the contaminating fuel oil, and depends upon treating the unsaponifiable matter, in a special and carefully described manner, with acetic anhydride in circumstances such that only the fuel oil is insoluble. Confirmation of the presence of fuel oil may be obtained by passing a solution of the oil in petroleum spirit through a column of activated aluminium oxide. If 0.005 per cent. or more of the fuel oil be present a dark ring forms at the surface, owing to the adsorption of asphalte, etc. This may be removed and treated further to differentiate it from the pale coloured deposits left by uncontaminated whale oils.

Glucose-Fructose Mixtures

Dealing with analysis of glucose-fructose mixtures, with special reference to honey, C. R. Marshall, Ph.D., A.I.C., and A. G. Norman, M.Sc., Ph.D., F.I.C., described a procedure for the direct determination of glucose and fructose in mixtures involving hypoiodite oxidation for glucose followed by a micro copper reduction method for fructose. The behaviour of these sugars in a mixture is not precisely additive, and no constant correction can be applied from fructose oxidised by the hypoiodite. From the analysis of known mixtures equations have been derived for amounts of glucose and fructose within the limits 0.04-0.08 g. of each. The presence of small proportions of sucrose is without effect on the method.

THE production of glyceryl phthalate resins has been handicapped by difficulties in phthalic anhydride manufacture. It is now hoped to instal a cheap process and thus guarantee an adequate supply of this raw material for the resin factory at Krasnopresnensk.

Analytical and Advisory Work of the Government Laboratory

Increased Number of Examinations of Duty-Free Alcohol

ACCORDING to the report of the Government Chemist upon the work of the Government Laboratory for the year ending March 31, 1937, the total number of samples examined in the course of the year, including those dealt with at the Chemical Stations, was 545,261, as compared with 546,279 in the preceding year, a decrease of 1,018. Compared with the numbers of samples examined last year, decreases of 10,000 in the samples of tea, which were abnormally increased to this extent last year owing to the occurrence of fires at the wharves, and of 6,000 in sugar composite samples have been counterbalanced by increases of 7,000 tobacco samples, and increases in silk, spirits, cocoa, wine and import-duty samples.

In recent years there have been large increases in the quantity of alcohol used duty-free under the Finance Act, 1902, Section 8. The Board of Customs and Excise consult the Department on the various aspects of denaturing and uses of this important raw material of chemical industry. This growing use of duty-free spirits and industrial methylated spirit in the manufacture of a wide range of substances involves an increase in the consultative work of the Laboratory apart from the examination of samples to ascertain whether the conditions of use laid down by the Commissioners of Customs and Excise have been fulfilled.

Dyestuffs

Thirty-six samples of imported colouring materials were examined to ascertain whether they contained synthetic organic dyes, the importation of which under the Dyestuffs (Import Regulation) Acts, 1920 to 1934, is prohibited except under licence.

The total number of hydrocarbon oil samples examined was 14,957, of which 9,406 were from imported and 5,545 from exported goods, the remainder being wrecked goods. Of that total 12,318 were hydrocarbon oils and 2,639 were miscellaneous composite goods, such as enamels, lacquers, leather colours, paints, varnishes, garage preparations, road dressings, solvents, insecticides, medicinal and toilet preparations, essential oils, lubricants, printers' ink, etc. A number of samples were examined with a view to determine whether illegal mixtures of kerosene with motor spirit were being made, since it is not allowable to mix dutiable with rebated oil except under licence and repayment of the rebate (Finance (No. 2) Act, 1931, Section 4).

Seven samples of heavy oils were also examined in connection with two prosecutions for using heavy oils for the purpose of road transport, without the prior repayment of the rebate of 7d. the gallon.

Both these cases were decided in favour of the Crown.

Instrument Testing

Hydrometers for ascertaining the strength of spirits or the specific gravity of hydrocarbon oils, saccharometers for use at breweries, distilleries and glucose factories, sets of weights for use in the collection of the silk duties, thermometers and graduated vessels of various descriptions are tested at the Laboratory as to their accuracy before being issued to the Officers of Customs and Excise. During the year 2,088 such tests were made. The Department is also responsible for the custody and maintenance of the principal reference spirit hydrometers. A new instrument (the Tate Saccharometer) for use in breweries and distilleries has been designed in the Laboratory, and, after exhaustive tests both here and under practical conditions of working, approved by the Customs and Excise Department. One hundred of these have already been calibrated and issued for use.

During the past year 9,264 samples were examined under the Safeguarding of Industries Act, including 36 samples which were examined both for dyes and liability to Key Industry Duty. Forty-four of the samples were examined in connection with claims for drawback of duties on exportation.

Seven hundred and ninety-six samples of wood naphtha, as well as other crude methyl alcohol naphtha, and 203 samples of pyridine and dyes intended for use in the manufacture of methylated spirits, were examined. Except in six instances the materials represented by the samples were approved as fit for methylating purposes.

Methylated Spirits and Alcohol

For the purpose of controlling methylated spirits or spirits other than methylated spirits used free of duty in connection with manufacturing operations, 3,097 samples of special denaturants, specially denatured alcohol, recovered spirits, residues from stills and articles manufactured with industrial methylated spirits and duty-free spirits were examined.

Three thousand three hundred and seventy papers were dealt with relating to applications to the Commissioners of Customs and Excise, either (1) in respect of claims for rebate of duty on alcohol used in making medicinal preparations or for scientific purposes; (2) in connection with permission to receive industrial methylated spirits and/or other forms of duty-free alcohol for use in manufactures, tuition and research; or (3) miscellaneous questions.

The other references dealt chiefly with the question as to whether the proposed use of the alcohol was, from the chemical point of view, such as to justify the granting of the particular indulgence asked for. Technical advice was also given in connection with the denaturing and control of duty-free spirits.

Examination of Fusel Oils

Fusel oil, whether imported or home produced, generally contains ethyl alcohol as an impurity, but duty is not charged on such ethyl alcohol unless upwards of 15 per cent. of proof spirit is present. Fifty-eight samples were examined for this purpose, and two were found to contain ethyl alcohol in excess of this limit. Thirty-nine samples of fusel oil from British distilleries were examined. Of these, fourteen were found to contain more than 15 per cent. of proof spirit, and delivery out of revenue control was refused until the proportion of spirit had been reduced.

The samples of sugar itself, from all sources, numbered 23,800, of which 1,864 were from beet sugar factories. Samples of preparations containing sweetening matter, or examined for sweetening material, numbered 52,359, of which 43,982 were from imported goods. This number does not include those samples which contained cocoa or spirit in addition to sugar.

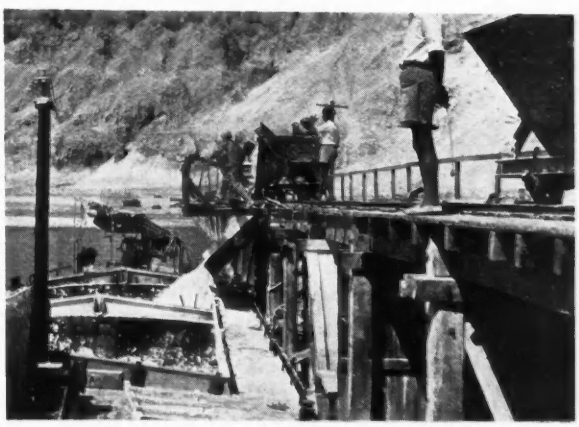
Saccharin has to be searched for in preparations in which there is any probability of its occurrence; 51 samples of imported substances were specially examined with this object, and in a large proportion saccharin was present. Most of the samples contained some other dutiable ingredient such as sugar, spirit or chloroform, and this had also to be determined.

Some 526 samples of saccharin and articles containing saccharin were examined for the purpose of assessing the amount of drawback payable on exportation, and 60 samples of saccharin and of the materials used in its production were likewise examined in connection with the assessment of duty on saccharin manufactured in this country.

Progress in Salt Recovery from the Dead Sea

Palestine Potash, Ltd., now have two works situated on the shores of the Dead Sea, from which they hope to be able to extract 100,000 tons of potash per year with proportionate quantities of other salts. At the works at the northern end of the sea there is a total evaporating area of about 1,000 acres, each evaporating pan being from 7½ to 30 acres in extent. The brine is pumped in these pans through a pipe laid on the bottom of the sea, the intake being at a depth of 175 feet where tests have shown that the water contains twice as much potash and bromine by comparison with surface water. The newly-established works at the southern end of the Dead Sea were built to extend the evaporating pan area, 23 square miles of land being available. At these new works the brine is pumped direct from the surface of the sea. This photograph shows two of the evaporating pans in which crude potash salts are in process of separating.

One of the pumping stations and adjoining power house. Here the water is raised a few feet and pumped through wooden pipes to the highest of the evaporating pans, which are so arranged that there is a constant slow movement of the evaporating brine from one pan to another on its way back to the sea. The refining plant is seen in the distance to the left of the photograph.



Recovered potash is transported to the northern end of the Dead Sea by special barges for shipment. In the background of this photograph can be seen part of the lower slopes of the rock salt mountain, Jebel Usdum, at the south-west corner of the sea.

Crude potash salts (carnallite) are collected from the evaporating pans as soon as a deposit 3 to 4 inches thick has accumulated. This carnallite is conveyed in trucks to the potash refinery, where it is decomposed with cold water and treated further to yield potassium chloride of different degrees of purity. The brine which remains after the removal of the carnallite is pumped to another part of the works for the extraction of bromine.

Investigations on the Manufacture, Properties and Nature of Glasses

Papers read before the Society of Glass Technology

FIVE important papers, amongst others, were read at a meeting of the Society of Glass Technology, held at Sheffield recently. In the first paper, Professor Dr. G. Keppeler, Hannover, Germany, dealt with the compositions and properties of the chief types of commercial glasses.

Composition and Properties of Commercial Glasses

Formerly, said Professor Keppeler, glass manufacturers were compelled to employ glass compositions of high lime and low alkali contents, because of the expensiveness of soda ash and sodium sulphate. Wherever possible natural raw materials were utilised. With the introduction of automatic machinery in bottle and sheet glass manufacture these compositions were no longer suitable on account of their high melting temperature and great tendency to devitrification, and it was necessary to employ more alkali and less lime in the composition. This decreased the durability of the glass, which, however, was still sufficient for containers in general. The Mylius classification of chemical resistance together with durability results obtained by the powder method, permitted the durabilities of soda-lime-silica glasses to be predicted. The conclusions agreed well with the durability results obtained by other workers for containers of different alkali contents.

The adherence of aluminium to glass and its technical applications was the subject of a paper by Dr. Bernard Long, of Glaceries de St. Gobain, Chauney and Cirey, Paris. He said that under certain conditions glass surfaces were readily metallised by spraying with aluminium. The metal coating was tenaciously held by the glass. Preferably, glass to be metallised should be toughened to resist the chilling action of the blast from the spraying gun. The reflecting power of aluminium coated glass enabled mirrors to be utilised in adverse weathering conditions for mirrors at cross roads, and pavement lights. Hollow glass bricks coated on the inside with aluminium greatly reduced the radiation losses obtained with the untreated bricks. Aluminium resistances on glass, in the form of strips sprayed in a zig-zag manner made efficient glass radiators, whilst floor blocks, coated with aluminium and forming a continuous electrical connection enabled heated floors to be used in offices and other rooms, the power expended being approximately 1,200 watts per 8 square meter to maintain a floor temperature of 30°.

Viscosity of Soda-Silica Glasses

A paper on the viscosity of the soda-silica glasses and its bearing on their constitution was read by Eric Preston, B.Sc., Ph.D., of the University of Sheffield. Employing a rotating cylinder apparatus, in which the inner and outer cylinders were of platinum, viscosities at high temperatures could be determined down to one poise. The relationship between viscosity and composition at any temperature was not a continuous one. There was a sharp break in the region of the sodium disilicate composition giving a pronounced minimum at this point in a manner exactly analogous to that found by C. H. Herty and co-workers in the CaO-SiO_2 system. These findings indicated that the vapour-pressure of volatilising alkali would be less on either side of the disilicate composition, in agreement with the fact that the vapour pressure of any substance is lowered by the presence of materials in solution. Two systems were thus obtained, namely, an S-shaped viscosity-composition curve between SiO_2 and $Na_2O.2SiO_2$, and a curve showing a maximum near to 35 per cent. Na_2O between $Na_2O.2SiO_2$ and $Na_2O.SiO_2$. The curve for this latter system was analogous to that for water-acetic acid, the viscosity-composition curve showing a pronounced maximum at 80 per cent. acetic acid.

Conclusions were discussed in the light of recent research on these glasses. It could not be doubted that above the liquidus temperatures the compounds $Na_2O.SiO_2$ were still present in the liquid state. Further, it was fundamentally erroneous to assume that the liquid phase was simply a mutual solution of Na_2O and SiO_2 when compounds were present in the solid condition.

Some new views on the nature of glass were reviewed by J. E. Stanworth, M.Sc.Tech., of the British Thomson-Houston Co., Ltd. On the basis of the theories of J. D. Bunce and A. G. Ward on the liquid state, an examination had been made of the viscosity changes in glass at temperatures between room temperature and the founding temperature. The increase in the factor B in the equation $\eta = Ae^{B/RT}$ as the temperature fell below the founding temperature could be simply explained by a decrease in average co-ordination number; by the co-ordination number of a molecule is meant the number of its immediate neighbours.

A study of the viscosity-temperature curves for stabilised glasses simplified the problem. The difference in the form of the B-T curves for stabilised and unstabilised glasses was not due to a difference in structure, but to the fact that time was necessary to reach an equilibrium value of average co-ordination. It was concluded that when the viscosity had increased sufficiently with falling temperature, further co-ordination change was impossible and B ceased to increase. In this range, a gradual " local freezing " began, which meant that the particles over a small volume ceased to be capable of relative movement. This should result in a decrease in B with further fall in temperature, and this result was actually found by W. Hänlein and M. Thomas for a silicate glass and by G. S. Parks and J. D. Reagh for a glucose glass.

Physical Property—Temperature Relationships

Dealing with physical property-temperature relationships and their bearing on the nature and constitution of glass, E. Seddon, B.Sc., Ph.D., of the University of Sheffield, said the main objects of his paper were (1) to relate the change of such physical properties of glasses as, viscosity, etc., with temperatures, (2) to co-ordinate one with the other these physical properties, and (3) to draw conclusions regarding the nature of glass, using for comparison substances other than glass, such as, metals, certain of the aliphatic alcohols, and water, concerning the structures of which substances something was already known.

The glasses investigated ranged from the elementary glass selenium, to fused boric oxide and silica, sodium borate and soda-silica glasses, and the complex soda-lime-silica glasses previously examined; in addition the organic glass glucose was included. Values of e (the energy of cohesion) based on experimental data for the above glasses decreased with rising temperature from a high value to two limits according to whether high SiO_2 or high B_2O_3 contents were present. This supported conclusions drawn from X-ray diffraction photographs on the structure of glass. Of the comparison materials, mercury, benzene and carbon tetrachloride gave E values independent of temperature; molten metals and some salts gave an increased energy of cohesion with rising temperature. Increasing length of the carbon spirals in the alcohols could be related to increasing values of e. Water with its tetrahedral grouping H_2O molecules gave supercooling in a similar manner to glasses of which the silicate type contained tetrahedral groups of Si and O ions.

Estimations of the number of particles (ions, atoms or molecules) per unit volume, could also be made from experimental data, which for glasses decreased rapidly, indicating the formation of progressively larger clusters of particles, with falling temperature.

Water Determination by Distillation

British Standard Specification for Apparatus

THE British Standards Institution has issued a specification for apparatus used for the determination of small quantities of water by distillation with an immiscible liquid (commonly called "entrainment distillation.") This method of distillation is finding increasing application in the determination of the percentage of water in various materials.

The British Standards Institution has already published a specification for graduated receivers for use in this method of determining the percentage of water, *i.e.*, B.S.S. for Graduated Receivers for Dean and Stark Apparatus, No. 614—1936. For some purposes it is convenient to use the receivers already standardised in conjunction with a flask and condenser appropriate for the operation in hand. When accurate and reproducible results are required in the determination of small amounts of water, it is desirable to have available a completely standardised apparatus, and the present specification has been prepared to meet this need.

The new specification (B.S.S. No. 756—1937) is based on the apparatus described by Tate and Warren, *Analyst*, 1936, *61*, 367. Copies can be obtained from the British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d., post free.

Heavy Chemicals in Canada

Productions of Acids, Alkalis and Salts

PRODUCTION of the heavy chemicals industry in Canada during 1936 was valued at $18,959,512, as compared with $19,012,615 in 1935. Substantial increases in output were reported for most of the individual products, but these advances were more than offset by rather severe declines for two or three of the important items. However, the over-all loss was small, amounting to only 0.5 per cent. Fourteen firms in this group in 1936 operated 20 factories of which 12 were in Ontario, 4 in Quebec, 3 in British Columbia, and 1 in Nova Scotia. These works represented a capital investment of $32,596,308. Employees numbered 2,966, and their earnings aggregated $3,988,310.

Products of the industry included 235,338 short tons of sulphuric acid, which total was the highest reported for any year, comparing with 224,410 tons in 1935, and with 205,325 tons in the previous year. Other products of this branch of the chemical industry include hydrochloric acid, nitric acid, glacial acetic acid, phosphoric acid, calcium carbide, calcium cyanamide, calcium chloride, caustic soda, soda ash, nitre cake, salt cake, Glauber's salt, cyanide, di-sodium and tri-sodium phosphate, sodium silicate, sodium chlorate, sodium hypochlorite, liquid chlorine, phosphorus, acid calcium phosphate, synthetic ammonia, sulphur dichloride, sulphur monochloride, ferric chloride, hydrogen peroxide, butyl acetate, ethyl acetate, paraldehyde, croton aldehyde, vinyl acetate, pentasol acetate, lead acetate, iso-butyl acetate, acetone, acetic anhydride, synthetic resins, acetylene carbon black, zinc oxide, and liquid sulphur dioxide.

Imports of acid of all kinds during 1936 were valued at $1,396,631, the principal items being stearic acid, citric acid, tartaric acid and boric acid. Exports of acids were appraised at $2,684,667. Imports of inorganic chemicals were valued at $8,557,161 and included sodium cyanide, sodium nitrate, zinc oxide, sulphate of alumina, liquid chlorine, calcium chloride, sodium bicarbonate, copper sulphate, tin bichloride, borax, caustic soda, sodium bichromate, sodium phosphate, litharge and sodium silicate. Exports of inorganic chemicals amounted to $9,656,112, mostly calcium cyanide, ammonium sulphate, sodium compounds and cobalt oxides and salts.

Amino-Nitrogen in Insoluble Proteins

Improved Method of Determination

AN improved method for the determination of amino nitrogen in insoluble proteins, has been devised by Rutherford, Harris, and Smith (*Bur. Standards Jour. Research*, 1937, *19*, 467-477). The method is based on the observation that when nitrous acid reacts with amino acids, the evolution of nitrogen is rapid during the first two hours, and then, at a definite point, becomes much slower, the amount of nitrogen produced at the well-defined turning point, corresponding fairly exactly to the content of amino nitrogen in the compound.

In carrying out the determination, it was found necessary to buffer the solution of sodium nitrite used at a fairly high *p*H (about 4), in order to reduce the spontaneous decomposition of nitrous acid in strongly acid solutions. 5 cc. of glacial acetic acid are mixed with 5cc. of saturated sodium acetate solution, and 6 gms. of sodium nitrite dissolved in 20 cc. of water added, the resulting solution being then introduced into the reaction vessel, and the nitrogeneous material added. The decomposition is allowed to proceed at room temperature, and the evolved nitrogen measured.

The method gives values for the amino-nitrogen content of proteins such as casein, gelatin, and egg-albumin, which agree well with those derived from other methods.

Chemical Matters in Parliament

Fuel Research

Mr. Edwards asked the Chancellor of the Duchy of Lancaster, as representing the Lord President of the Council, the amount of money spent by the Government during the last year on fuel research, and the total amount spent since the establishment of the Fuel Research Board?

In reply, the Chancellor of the Duchy of Lancaster (Earl Winterton), said the total net expenditure from the vote of the Department of Scientific and Industrial Research on fuel research and on the Physical and Chemical Survey of the National Coal Resources in the financial year ending March 31, 1937, was £92,881. The estimated cost of services by other Departments in that year (including cost of erection and maintenance of buildings, etc., rates, postage and stationery), was £10,050. Corresponding figures for the period of 20 years from April 1, 1917 (the year in which the Fuel Research Board was appointed), to March 31, 1937, are £1,270,787 and £309,699 respectively, including the capital expenditure incurred in the erection and equipment of the Fuel Research Station, East Greenwich, and of extensions thereto.

Mr. Edwards then asked if these figures included researches into the production of oil from coal; and, if so, could he have an assurance that the information may be placed at the disposal of the Falmouth Committee?

In reply, Earl Winterton said that was a very complicated question. It really rests between two Departments.

Phosgene Gas for China

On December 8, Mr. McEntee asked the President of the Board of Trade whether he was aware that in a Japanese news service distributed to Members of Parliament it was alleged that 12 tons of phosgene gas had been shipped from England to China.

In reply, Mr. Robert Hudson, secretary, Overseas Trade Department, replied that no phosgene had been exported from the United Kingdom since the commencement of this year, with the exception of three tons consigned for dye-works in Holland.

New Technical Books

"Toxicity of Industrial Organic Solvents:" Summaries of published work. Compiled by Ethel Browning under the direction of the Committee on the Toxicity of Industrial Solvents. pp. 396. H.M. Stationery Office, 7s. 6d.

This book is a summary of all the known published work in connection with the poisonous properties of volatile solvents and should be welcomed by those who are concerned with the health of workmen in the chemical industry. It is a fairly comprehensive work, covering a very wide field, as it must do, considering the diversity of solvents which are in common industrial use. The subject has been largely neglected, and frequently the first indication of the toxic properties of a liquid have been the symptoms of poisoning apparent in men coming into contact with the vapour. The solvents discussed are divided into groups depending on their chemical constitution; in general, if one solvent in a group is dangerous every member of that group is a suspect. Actually it appears that every solvent should be treated with a certain amount of suspicion, for even if there are no immediate effects, there may be cumulative and secondary effects which are at first difficult to diagnose, and often impossible to cure completely. Diverse and apparently unrelated symptoms may be produced by small doses of a solvent. The evil effects of inhaling vapour over a considerable period may not at first be apparent, and in many cases do not appear for years, but the solvents are none the less dangerous on that account. Although the compilers have studied a great deal of published matter in connection with the effects of small doses of toxic liquids, the results given are chiefly those of experiments on animals. Only in the relatively few cases where fatalities have occurred can they give the precise symptoms of poisoning, and even in these cases there appears to be some divergence of views among the medical men who have examined cases.

The groups of solvents studied are hydrocarbons, chlorinated hydrocarbons, alcohols, esters, ketones, cyclohexane derivatives, and glycols, together with a few solvents which do not fall into these classes; the most dangerous groups are the first three. Benzene, toluene and xylene among the hydrocarbons are dangerously toxic and continued inhalation of their vapours may produce serious effects. The chlorinated hydrocarbons are better known as far as their toxic effects are concerned, and chloroform may be taken as a typical member of that group. The alcohols are well known to be poisonous, though it is interesting to find that amyl alcohol is regarded as the worst of them. Only in isolated cases are members of the other groups dangerously toxic, but all of them are toxic, and none should be treated lightly. The absence of known cases of poisoning is not due so much to their safety, as to the few industries in which they are used. Indeed, it is rather a suspicious coincidence that the most dangerous solvents are also the most common ones. In the cases where there have been no accidents among workmen, the results of experiments upon animals indicate roughly the degree to which they would be poisonous to human beings.

The Home Office are to be complimented on producing such a complete survey of a difficult subject, but considering the excellence and usefulness of the book it is surprising to note the absence of details of the toxic effects of two extremely dangerous solvents—aniline and nitrobenzene. Other groups which demand some study are the furane derivatives, the low molecular weight fatty acids, the amines and the terpenes. Many members of these groups are used in industrial processes, and though some of them may not be toxic, it would be well to know that they are not.

Weeds, Weeds, Weeds. By Sir Charles V. Boys. Pp. 71. London: Wightman and Co., Ltd. 1s.

The battle with weeds is often a drawn battle in which a sort of equilibrium is the utmost that can be hoped for. The author of this book has taken an active part in this unequal struggle with few intermissions for seventy years, first at Wing in Rutland, then in Chelsea and South Kensington, and for nearly a quarter of a century at St. Mary Bourne, near Andover. He does not seek to dictate to any who may venture to read this book. Assuming that they are engaged in the never ceasing fight against weeds, he discusses the problem in a most intimate way.

Catalytic Processes in Applied Chemistry. By T. P. Hilditch and C. C. Hall. 2nd edition. Pp. 478. London: Chapman and Hall, Ltd. 25s.

Since the first edition of this book appeared new applications of catalysis have been made in industry, existing processes have been further developed and improved, and in other cases the catalytic nature of a process has become more clearly defined. The authors have endeavoured to deal with these recent acquisitions to industrial technique in the same manner as that in which the subject was treated in the first edition, with the result that the book has increased in size by about 100 pages. The additions which have been made include the important group of processes concerned with the production of liquid fuels from coal, tar, petroleum or water-gas. Here the position has become much more clear and, in contrast to 1928, the part played by catalysis in the various operations is now clearly to be distinguished. New catalytic processes are now employed in various directions. Notable examples are the catalytic production of "polymer" petrol, of lubricating oils, and of higher fatty alcohols from fats by high-pressure hydrogenation. Processes already dealt with in the previous edition have in many cases undergone changes. For example, there is the use of vanadium oxide catalysts in contact with sulphuric acid manufacture; fresh developments in the methods for producing acetaldehyde and for the manufacture of industrial solvents and other compounds related to acetaldehyde, such as acetone, acetic anhydride, acetic acid, and butyl alcohol.

Very Low Temperatures. Book Two. By T. C. Crawhall and O. Kantorowicz. London: H.M. Stationery Office. 2s.

Very Low Temperatures. Book Three. Edited T. C. Crawhall. Pp. 74. London: H.M. Stationery Office. 1s. 3d.

"Book Two" provides an illustrated record of a special exhibition on the subject of very low temperatures, held at the Science Museum in London in 1936. By publication it is hoped to create a wider interest in the subject, and to provide assistance for teachers and students in the reproduction of apparatus for the purpose of experiment and demonstration; to serve this purpose the number of illustrations and diagrams is intentionaly large. The special exhibition on Very Low Temperatures was one of a series of such exhibitions on various branches of science and technology which have been held at the Science Museum, and was the sequel to an exhibition on Refrigeration in 1934. In "Book Three" are published seven lectures which were delivered at the Museum by leading authorities on the scientific and industrial aspects of the subject of very low temperatures.

A Scheme of Inorganic Qualitative Analysis. By E. M. Stoddart. Pp. 39. London: William Heinemann, Ltd. 1s. 6d.

In this volume no precise directions as to how to carry out the tests are given, as the author expects that the book will be used by students who have had some guidance in carrying out ordinary laboratory operations. The book serves the deliberate purpose of leaving out inessential and confusing details. It should be found suitable for students taking general science examinations up to B.Sc., and pharmaceutical chemistry up to Ph.C.

Pharmacy and Poisons Act

Home Office Notice to Traders

THE Home Office calls the attention of traders to the Poisons List (Amendment) Order, 1937 (S.R. and O. 1937, No. 1029) and the Poisons (Amendment) Rules, 1937 (S.R. and O. 1937, No. 1030), which were made by the Secretary of State on November 2, 1937. The amending rules incorporate certain amendments which have been in force since April 24, 1936, by virtue of the provisional rules made on that date.

All the metallic oxalates are now placed in Part II of the Poisons List, but an addition has been made to the fifth schedule to the Poisons Rules, 1935, the effect of which is to prohibit the sale of metallic oxalates (other than potassium quadroxalate) by listed sellers except in the form of photographic solutions. The item " phenylene diamines; toluene diamines; their salts " in Part II of the Poisons List has been extended to include " other alkylated-benzene diamines " and a similar addition has been made in the third and the seventh schedules to the Poisons Rules. Rule 8, which provides for relaxation of Section 19(3) of the Act in certain circumstances, has been re-cast. Amendments have been made in the first schedule to the Rules so as to include all the active principles of digitalis; and the exception in favour of substances containing less than 0.1 per cent. of hydrocyanic acid has been extended to cover substances containing less than 0.15 per cent.

Certain amendments have been made in the general exemptions in Group I of the third schedule. Amendments have also been made in the special exemptions in Group II of the third schedule in respect of ammonia, salts of barium, dinitrophenols and potassium hydroxide. The amendments relating to ammonia, dinitrophenols and potassium hydroxide were put into force under the Poisons (Amendment) Rules, 1936. (Provisional Rules and Orders, 1936). Minor drafting amendments have been made to Rules 17 and 26.

Chemistry in the Ancient World

Professor Partington Delivers 40th Bedson Lecture

THE 40th Bedson lecture was delivered on November 26, in the chemistry lecture theatre of King's College, Newcastle, by Professor J. R. Partington, the subject being " Chemistry in the Ancient World."

The lecture dealt mainly with the period 4000-1000 B.C. and showed how the outstanding achievements in applied chemistry during this period were made in three principal regions, namely, Egypt, Mesopotamia and Crete. The working of metals appears before 3500 B.C. in Egypt and Mesopotamia, and somewhat later in Crete and Cyprus. The earliest metal known was probably gold, although copper was known very early in Egypt. The metals silver, lead and iron were also known in the earliest period, but were scarce. Refining of gold appears about 525 B.C. An important copper industry was established in Egypt, the malachite ore being mined in Sinai. The use of iron and steel is found among the Hittites and related peoples at the time of the eighteenth dynasty in Egypt, and iron was freely used by the later Assyrians. Brass was known in Palestine about 1400-1000 B.C.; and since the brass industry was later established in Cyprus some relation between the two regions by way of Râs Shamra seems to be indicated. The techniques of metal workers differed in different regions. The production of bronze was an important event and the source of the early tin is still doubtful.

The production of black-topped pottery and the preparation of glazes in Egypt was described by the lecturer. Glass itself was known in Egypt and Mesopotamia in 3000 B.C., the Egyptians being very skilled in its manufacture and colouring, although blown glass does not seem to have been made until the beginning of the Christian Era. Indigo and safflower were used as dyes in ancient Egypt; in Mesopotamia there were the beginnings of the petroleum industry with extensive use of bitumen for cement and asphalt.

Chemical Notes from Foreign Sources

Sweden

PRODUCTION OF OIL AND PETROL FROM WOOD is to be started on an experimental scale at Perstorp, near Klippan.

Manchukuo

THE FEASIBILITY OF EXTRACTING SODA from Lake Dupussnor in the Kaitung region is under examination by experts of the South Manchurian Railway Co.

Jugoslavia

ANTIMONY DEPOSITS NEAR LISA ARE TO BE EXPLOITED by a new company (operating mainly with foreign capital), the formation of which has been approved by the Ministry of Commerce.

Roumania

A SATISFACTORY METHOD OF PRODUCING CELLULOSE and nitrocellulose from common reeds is reported to have been developed by the War Ministry. With a vast area of reed-covered country, an annual output of 2 million tons cellulose could be secured from this source.

Germany

A HELIUM-PURIFYING PLANT is to be built at Frankfort-on-Main to the order of the German Zeppelin Co.

WOOD PULP MANUFACTURE, utilising Swabian beechwood, will be carried on by the newly-formed Schwabische Zellstoff A.-G., of Ehingen-on-the-Danube, which has been largely financed by the Swabian textile industry.

A NEW RAYON-PRODUCING FIRM, the Rhenische Kunstseide A.G., of Krefeld, has been formed with a capital of 7.4 million marks. The building of a factory with an annual capacity of 3,500 tons will commence in January.

Lithuania

A COMMISSION IS CONSIDERING THE PROSPECTS of the Bergius and Scholler wood-saccharification processes for Lithuania.

Italy

UTILISATION OF METHANE as a motor fuel is under examination in view of the considerable annual production of 12 million cubic metres.

Poland

A NITRIC ACID WORKS IS UNDER CONSTRUCTION at Chorzov, by the Zjednoczone Fabryki Zwiakov Azotovych in association with the Union Chimique Belge.

A GOVERNMENT SUBVENTION OF 15,000 ZLOTY has been granted towards the cost of building an experimental cold storage plant. Among the problems to be studied is the behaviour of fruit trees and seeds at low temperatures.

France

PRODUCTION OF HEXAMETHYL BENZENE in fair yield from mesitylene is described by Vavon and Bolle (*Compt., rend.* 1937, *204*, 1826).

THE SOCIETE DES PRODUITS CHIMIQUES ET ENGRAIN D'AUBY announces a net profit of 6.11 million francs for the past trading year (previous result 4.34 million) and distributes a dividend of 12 francs per share (against 10 francs). Although new plant for ammonium and potassium nitrates was completed as far back as November, 1936, production has been held up by the impossibility of obtaining adequate supplies of liquid ammonia. During the year the concern embarked upon the construction of a synthetic ammonia plant at Fauchy which will incorporate the latest technical advances and is expected to be ready for production in about a year.

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Malachite green. Karr, *Text. Colorist*, *59*, 770-775.

Glass, Ceramics

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Personal Notes

MR. F. A. LEATHERS has been elected a director of William Cory and Son, Ltd.

MR. GRIFFITHS MORGAN, J.P., has been elected a director of S. Instone and Co., Ltd.

DR. J. M. STEVELS has been appointed a honorary research fellow in physical chemistry at Manchester University for the current session.

SIR FRANK A. SWETTENHAM and MR. J. G. HAY have been presented with the gold medal of the Rubber Growers' Association.

MR. ROWLAND GEORGE WALTON, of Tillington, Abbey Drive, Rhos-on-Sea, bleacher, left estate valued £24,710, with net personalty £22,826.

MR. ERNEST WARHURST, M.Sc., Ph.D. (Manchester), has been appointed temporary assistant lecturer in chemistry at Manchester University.

MR. DAVID MACDONALD MACALISTER, consulting sugar chemist, formerly of Upper Greenside, Newburgh, and afterwards of Barmore House, Abernethy, left £4,599.

MR. THOMAS EUSTACE SMITH, J.P., of North Hill, Colchester, a former director of the British Xylonite Co., has left estate valued at £60,284, with net personalty £49,497.

MR. THOMAS HANSON has been elected to the board of Sir S. A. Sadler, Ltd., colliery owners and chemical manufacturers, Middlesbrough. He started with the firm as an office boy 52 years ago.

CAPTAIN CEDRIC WILLIAM JACOB, of Merle Dene, Eleanor Road, Bidston, a director of W. and R. Jacob and Co., biscuit manufacturers, and a director of the Liverpool Gas Co., left estate valued at £42,929, with net personalty £40,215.

MR. HORACE WARING, of Great Crosby, Lancashire, chief engineer to Goodlass Wall and Lead Industries, Ltd., and a director and general manager of the Librex Lead Co., has left estate valued at £3,878, with net personalty £3,198.

PROFESSOR FREDERICK GEORGE DONNAN, director of the chemical laboratory at the University College, London, has received an honorary degree on the occasion of the celebration of the 400th anniversary of the University of Coimbra, Portugal.

DR. LOUIS ELLIS has been appointed biochemist in the pathological department at Leeds University, and has resigned from the post of clinical pathologist in the department of clinical investigation and research at Manchester University.

PROFESSOR ALEXANDER M'KENZIE, F.R.S., is to retire from the chair of chemistry at University College, Dundee. He has held this post since 1913, when he succeeded the late Professor Hugh Marshall. Prior to his Dundee appointment, he was for some time head of the chemistry department at Birbeck College, London.

MR. DEXTER NORTH, chief of the chemical division of the United States Tariff Commission, has resigned to become the Washington technical representative of Arthur D. Little, Inc., research chemists and engineers, Cambridge, Mass. In his new work, Mr. North will continue to deal with statistical information concerning the chemical process industries.

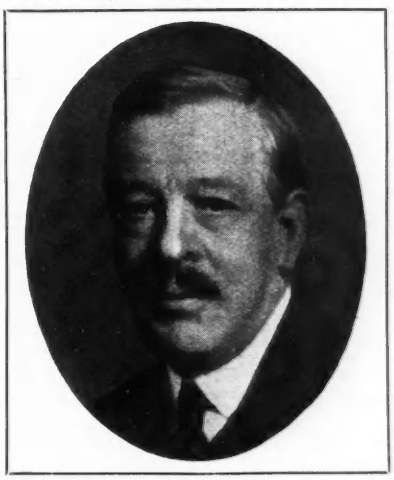
EMERITIUS PROFESSOR G. G. HENDERSON, who recently retired from the chair of Chemistry in Glasgow University, was presented with gifts in recognition of his services to science by the local members of various chemical societies at the Ramsay Chemical Dinner, held in the Central Hotel, Glasgow, on December 3. Sir James Irvine, principal and vice-chancellor of St. Andrews University, presided. In handing over to Professor Henderson a beautiful model of the "Comet," Sir James said that was only a token of the gifts they were presenting, namely, a boat and fishing gear, which were too large to bring into the dining-room hall. There was, he added, a cheque inside the "Comet."

OBITUARY

MR. STEPHEN VIVIAN, a director of the Dartmoor China Clay Co., Ltd., with which company he has been associated for a long period, died last week at the age of 80.

Dr. GUSTAF DALEN, managing director of the Swedish Gas Accumulator Co., who was awarded the Nobel Prize for Physics in 1912, died on Thursday, aged 68.

MR. ALBERT EDWARD THOMPSON, of Gatacre Park, Bridgnorth, senior governing director of John Thompson Engineering Co., Ltd., Wolverhampton, makers of chemical plant, has died at Llandudno, after a long illness, at the age of 71. He had been associated with the engineering works at Ettinghall for 57 years, having started at the age of 14. He took an active interest in the management of the business, and became the first chairman of the new John Thompson Engineering Co., Ltd., on its formation, about eighteen months ago. He resigned from the chairmanship in April, 1937, on account of ill-health. Until recently Mr. Thompson was also a director of the Sankey Sugar Co., Ltd., of Earlestown, Lancashire.



Mr. A. E. Thompson

DR. ROBERT OSWALD HALL, A.I.C., research chemist to a large manufacturing company in London, was accidentally electrocuted at his home, at Putney, last week, while in the act of moving an electric radiator when leaning from his bath. Dr. Hall, aged 32, was educated at Wakefield Grammar School, and Leeds University, where he took his Ph.D. degree in 1930. At the university he was the holder of the Lord Kitchener Memorial Scholarship, 1925, and also the Walker Wilson Research Scholarship in textiles. After holding an appointment for a short while at the Government Laboratory, Clement's Inn, London, he was for three years a research fellow in the textile department of the Ontario Research Foundation at Toronto, Canada. In 1934 he returned to England and took up the post which he held at the time of his death.

EXPERIMENTS on the catalytic dehydration of ethyl alcohol by samples of commercial alumina are reported by Alexander, Horn, and Munro (*Can. Jour. Res.*, 1937, *15*, 10, 438). The effect on the dehydrated characteristics of two samples of ordinary commercial alumina, of variation of the water content at 318°, was investigated. It was found that there was one optimum content of 2 per cent. at which the production of ethylene was at a maximum, and the production of ether was practically zero, and another optimum point at 6 per cent. at which the characteristics were exactly reversed. When operating with catalysts of high initial water content (10-20 per cent.), the efficiency for either process passed through a series of maxima and minima as the amount of alcohol decomposed increased. The height of the maxima decreasing as the age of the catalyst increased.

From Week to Week

THE 1938 EDITION of THE CHEMICAL AGE Year Book will shortly be published. It is free to all direct subscribers to THE CHEMICAL AGE registered before January 1, 1938. Non-subscribers, desirous of receiving a copy of the book, should register as soon as possible.

OIL HAS BEEN STRUCK AT DALKEITH, in Scotland, at a depth of 900 ft.

A 20 PER CENT. CUT IN THE EXPORT QUOTA for the first three months of 1938 have been announced. The quota will be 70 per cent., compared with the present figure of 90 per cent.

BY THE OPENING OF A NEW FACTORY at Waltham Abbey, Essex, Catalin, Ltd., plastic material manufacturers, are able to guarantee quicker delivery of Catalin, which is a synthetic phenolic resin.

THE STOCK EXCHANGE COMMITTEE FOR GENERAL PURPOSES has announced that it has withdrawn permission to deal in the shares of the Branston Artificial Silk Co., Ltd., and has suspended the official quotation for the shares.

THE NATIONAL MUNITIONS BOARD at Washington, has approved the export of 7,900,000 cu. ft. of helium gas during the year beginning last month. This approval has been given to the application of the American Zeppelin Co.

INTERNATIONAL TECHNICAL DEVELOPMENTS, LTD., have introduced a new vapour-proof snap-action precision switch for electrical equipment and control gear. It is useful for gauging and counting devices, pressure and liquid level controls, time-lag mechanisms and other industrial and laboratory equipment.

HOWARDS AND SONS, LTD., announce that their works, warehouses and offices will be closed on Saturday, December 25, and Monday, December 27. Warehouses will be closed also on Thursday, December 30, and Friday, December 31 for stock-taking, and on these days no goods can be despatched or received.

SCOTTISH ALLOYS, LTD., has secured a lease for a factory on the new industrial estate at Hillington, Glasgow. The floor space of the new factory will be about 25,000 sq. ft., and production is expected to start early in 1938. The company's products will include high-duty non-ferrous alloys, and die castings (gravity and pressure).

THE NETHERLANDS EAST INDIES crop licences for native rubber in the outlying districts for March, 1938, will be on a nil basis. No export of native rubber will thus be allowed for March. As the January and February licences are on a basis of 90 per cent., the average for the first quarter of 1938 will be 60 per cent. per month.

SETACYL DIRECT YELLOW 8 G SUPRA, introduced by the Geigy Colour Co., Ltd., is a new, very greenish and bright canary yellow for dyeing acetate rayon. It is distinguished by the good general fastness properties characteristic of this group and particularly by good dischargeability. In combination with Setacyl Direct Discharge Blue G Supra bright, clear and dischargeable green, from yellowish to bluish tones can be produced.

ONE MAN WAS SEVERELY BURNED about the face and hands and another received burns to his hands when fire broke out at the munition factory of Imperial Chemical Industries, Ltd., at Linlithgow, Scotland, on December 6. The injured are William Neechan, of Blackness Road, Linlithgow, and Alexander Scott, of Bardovan. About three months ago an explosion occurred in the same factory, when one man died from his injuries. The factory was opened about 18 months ago after having been closed down for two years.

PRESIDING AT THE ANNUAL MEETING of Potgietersrust Platinums, held at Johannesburg on December 7, Mr. Jas. H. Crosby, the chairman, after drawing attention to the increase in the loan from "Johnnies" Co., for the purpose of enlarging the plant, said that operations at the Rustenburg property were carried out uninterruptedly throughout the year. Sales of platinum showed an improvement and resulted in a credit balance of £2,673 sterling on working account. The new sorting, milling and smelting plants were now operating and handling 15,000 tons monthly.

SEARCH FOR OIL IN CENTRAL EUROPE has made good progress during the last few months. Prospecting in Czechoslovakia was promoted by the State early after the war, while it began only in 1929 on the Austrian side, when a special law was promulgated in order to encourage private boring by tax and freight facilities. The daily average figure, November, 1937, was 130 tons. The large oil concerns, which had shown but a detached interest in this business at the start, founded a joint-stock company for crude oil production some time ago. Both Shell and Vacuum Oil are participants in this company, whose capital is 3,000,000 schillings. As the Austrian oil contains 8 to 10 per cent. of benzene only, plans to establish a cracking plant have been put forward.

THE METROPOLITAN-VICKERS ELECTRICAL CO., LTD., who have been carrying on a small-scale production of their new plastic "Traffolyte," have equipped a factory at Trafford Park, Manchester, for increased production. "Traffolyte" is produced in sheets in a variety of forms. It is heat-resisting, impervious to most corrosives, highly weatherproof and, in some forms, fireproof.

TOWERS TUBE CONNECTORS (Prov. Pat. 26,456) for Dreadnought glass pipe-lines are described in "The Towers Messenger" for December. These connectors form a full-bore joint between two glass tubes which is mechanically strong, but has sufficient flexibility to take up local stresses. They are made of Nordac ebonite which is practically unbreakable, and the joint is corrosion-resisting inside and out.

AN EXHIBITION OF STAINLESS STEEL has been opened for a period of several months in the New York Museum of Science and Industry, Rockefeller Center, New York City. This exhibition has been sponsored jointly by Electro Metallurgical Co. (Union Carbide and Carbon Corporation), New York, and the Museum. The display includes hundreds of stainless steel products sent to the exhibit by manufacturers from all over the United States.

HINTS ON THE WELDING AND RIVETING OF ALUMINIUM and its alloys are given in a new booklet issued by the Northern Aluminium Co., Ltd. It is pointed out that there are no difficulties provided the correct technique and good quality materials are provided. So far as aluminium and its alloys are concerned welding may be divided into three main classifications: (1) Fusion or autogenous welding using oxy-acetylene or oxy-hydrogen flames; (2) electric-arc fusion welding, including the metallic arc carbon arc and atomic hydrogen arc welding processes; (3) electric resistance welding, including butt, spot and seam welding. Practical details are given about the choice of the correct welding rod or wire, the adjustment of welding flames, and pre-heating. Part of the booklet is devoted to the design of riveted joints. There are also some comprehensive tables giving the mechanical properties of aluminium alloys and welded and riveted aluminium alloys under various conditions.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa.—H.M. Senior Trade Commissioner in South Africa reports that the Municipality of George, Cape Province, is calling for tenders (Contract No. 31-A/1937) for the supply, delivery and erection of a complete water purification plant, to include the necessary equipment for chemical treatment, chemical mixing, flocculation, rapid gravity filtration, carbonisation and chlorination. Tenders, endorsed "Contract 31-A/1937," should be addressed to the Town Clerk, Municipal Council of George, Cape Province, South Africa, by whom they will be received up to noon on January 12, 1938. (Ref. T.28922/37.)

Australia.—A well-established agent at Perth wishes to obtain the representation, on a commission, purchasing or consignment basis, of United Kingdom manufacturers of gums and resins for Western Australia. (Ref. No. 363.)

Belgium.—A firm of manufacturers of colours and varnish established at Haren-Brussels wish to obtain the representation of United Kingdom manufacturers of synthetic enamel (air-dried and oven dried). (Ref. No. 373.)

Italy.—An agent established at Turin wishes to obtain the representation, on a commission basis, of United Kingdom exporters and manufacturers of wood pulp for paper mills and rayon factories. (Ref. No. 377.)

Norway.—A firm established at Oslo wishes to obtain the representation of United Kingdom manufacturers of machinery, equipment and supplies for the wood pulp and paper making industries, including felts, filters, wires, wire cloth, stainless and acid-resisting steel, lead and raw materials. The firm are prepared to import for their own account, or to act as agents. (Ref. No. 378.)

Egypt.—The Commercial Counsellor to H.M. Embassy in Egypt reports that the Egyptian Ministry of Education Stores Department, is calling for tenders for the supply and delivery to the Trade Schools during the year 1937-38 of quantities of painting and decorating materials, including varnishes, enamels, paints, driers, cotton wool, spirits, oils, soft soap, etc. Tenders should be addressed to the Assistant Under-Secretary of State, Ministry of Education, Sharia el Falaki, Cairo, by whom they will be received up to 10 a.m. on January 4, 1938. A copy of the schedule of requirements is available on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Ref. T.Y.28789/37.)

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

PRODUCTION OF PHOSPHATIC FERTILISERS.—Aktiebolaget Kemiska Patenter. (Germany, Nov. 10.) 33107.

BEARING-METAL ALLOYS.—C. Arnold (Cleveland Graphite Bronze Co.). 32988.

MANUFACTURE OF LUBRICANTS, ETC.—C. Arnold (Cleveland Graphite Bronze Co.). 32858.

PROCESS FOR RENDERING FABRICS CONTAINING WOOL UNSHRINKABLE.—W. H. Beeston (Potts). 32446.

TREATMENT OF COKE.—T. A. and W. L. Bell. 32815.

RUBBER LATEX.—F. W. Boiardi, and E. W. Wren. 32459.

MANUFACTURE OF NITRILES.—Boots Pure Drug Co., Ltd., and A. P. T. Easson, and F. L. Pyman. 32736.

APPLICATION OF LOW-TEMPERATURE DISTILLATION TO BOILER-COAL. British Coal Distillation, Ltd., E. H. G. Aram, R. D. Hardy, and C. Machen. 32885.

MANUFACTURE OF RESINOUS COMPOSITIONS.—British Thomson-Houston Co., Ltd. (United States, Dec. 4, '36.) 33073.

MANUFACTURE OF CELLULAR INDIARUBBER.—J. A. Bunch. 33228.

MANUFACTURE OF CELLULAR RUBBER ARTICLES.—J. A. Bunch. 33229.

MANUFACTURE OF CONDENSATION PRODUCTS.—A. Carpmael (I. G. Farbenindustrie.) 32808.

PURIFICATION OF FLUE-GASES.—R. E. Cleaton. 32463.

MANUFACTURE OF UREA.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. (France, Dec. 9, '36.) 33032.

DEHYDRATION OF CARBON DIOXIDE AND AMMONIA.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges et Camargue. (France, Dec. 11, '36.) 33033.

PREPARATION OF SILICA for glass batches.—Corning Glass Works, and R. Haddon. 33244.

DYEING OF CELLULOSE TEXTILES.—Courtaulds, Ltd. 33086.

DRYING OF STARCH.—C. V. Daumas. 32797.

REDUCTION OF ZINC OXIDE, ETC.—F. L. Duffield. 32542.

MANUFACTURE OF POLYMERISABLE OILS.—E. I. du Pont de Nemours and Co. (United States, Dec. 1, '36.) 33269.

MANUFACTURE OF THROMBIN.—H. Dyckerhoff. (Germany, Dec. 5, '36.) 32569.

HETEROCYCLIC COMPOUNDS.—A. J. Ewins, and M. A. Phillips. 32925.

MANUFACTURE OF THIOACETALSULPHONIC ACIDS.—J. R. Geigy, A.-K. (Germany, Nov. 26, '36.) 32517.

PRODUCTION OF ALUMINIUM COMPOUNDS, ETC.—R. Goldberg. 32728.

MANUFACTURE OF ALDEHYDES.—W. W. Groves. 33226.

MANUFACTURE OF PULVERULENT SUBSTANCES.—W. W. Groves (I. G. Farbenindustrie.) 32511.

MANUFACTURE OF THERMOPLASTIC CONDENSATION PRODUCTS.—W. W. Groves. 32512, 32515.

MEANS FOR DYEING MIXTURES OF CELLULOSE and animal fibres. W. W. Groves (I. G. Farbenindustrie.) 32514.

MANUFACTURE OF OXAZINE DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 32516.

IMPREGNATION, ETC., OF FIBROUS MATERIALS.—W. W. Groves (I. G. Farbenindustrie.) (June 2, '36.) 33188.

ELECTROLYSIS OF SALT SOLUTIONS.—I. G. Farbenindustrie. (Germany, Dec. 31, '36.) 32519.

MANUFACTURE OF CONDENSATION PRODUCTS.—I. G. Farbenindustrie. (Germany, Dec. 16, '36.) 32661.

MANUFACTURE OF ARTIFICIAL STRUCTURES from solutions of cellulose.—I. G. Farbenindustrie. (Germany, Jan. 11.) 33057.

MANUFACTURE OF SENSITISING DYES.—I. G. Farbenindustrie. (Germany, Jan. 25.) 23058.

MANUFACTURE OF ALDEHYDES.—I. G. Farbenindustrie. 33226.

ACETATE ARTIFICIAL-SILK DYESTUFFS.—Imperial Chemical Industries, Ltd., and W. W. Tatum. 32969.

MANUFACTURE OF RUBBER THREAD.—International Latex Processes, Ltd. (Italy, Dec. 19, '36.) 33185.

MANUFACTURE OF HYDROGENATED OILS, ETC.—L. Mellersh-Jackson (Commercial Ingredients Corporation.) 33060.

MANUFACTURE OF LUMINESCENT SCREENS.—H. G. Jenkins, and A. H. McKeag. 32694.

POLYMERISATION-APPARATUS.—G. W. Johnson (I. G. Farbenindustrie.) 32547.

MANUFACTURE OF AZO-DYESTUFFS.—G. W. Johnson. 32548.

MANUFACTURE OF ZINC-DUST.—G. W. Johnson (I. G. Farbenindustrie.) 32955.

MANUFACTURE OF OLEFINES, ETC.—G. W. Johnson (I. G. Farbenindustrie.) 33082.

MANUFACTURE OF HALOGEN-MONO-OLEFINES.—G. W. Johnson (I. G. Farbenindustrie.) 33083.

MANUFACTURE OF ACETALDEHYDE.—G. W. Johnson (I. G. Farbenindustrie.) 33084.

THERAPEUTIC PRODUCTS.—E. Lilly and Co. 33270.

COATING-AGENTS, ETC.—G. W. Johnson (I. G. Farbenindustrie.) 33224.

VACUUM-DISTILLATION OF OILS.—Kodak, Ltd. (United States, Nov. 27, 1936.) 32773.

TREATMENT OF BAUXITE RESIDUES.—A. P. Laurie. 32826.

PRODUCTION OF OIL-SOLUBLE BISMUTH SALTS.—E. Lilly and Co. 33271.

EXTRACTION, ETC., OF ERGOTOCIN.—E. Lilly and Co. 33272.

TREATMENT OF SOLID CARBONACEOUS MATERIALS.—F. Lloyd. 32469.

CATALYTIC PRODUCTION OF HYDROCARBONS.—Metallges, A.-G. (Germany, Nov. 30, '36.) 32983, 32984, 32985, 32986.

ORGANO-METALLIC COMPOUNDS for motor-fuels, etc.—J. J. Michaëlis. 33273.

SEPARATION OF SULPHURIC ACID from mixtures of sulphuric acid and sulphuric acid esters.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, Dec. 24, '36.) 32546.

PREPARATION OF ALKYL CHLORIDES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, Dec. 30, '36.) 33260.

DISTILLATION OF TAR.—T. Ness, Ltd., and O. E. Reynard. 33019.

MANUFACTURE OF ALKALI SILICATE-CONTAINING PRODUCTS.—Pennsylvania Salt Manufacturing Co. (United States, March 18.) 33225.

FERROUS ALLOYS.—G. W. Preston, and W. B. Sallitt. 33022.

TREATMENT OF SOLID CARBONACEOUS MATERIALS.—H. Quennell. 32469.

TREATMENT OF CELLULOSE, ETC.—Ridgway, Whiting, and Bodenschatz, Inc. (United States, Nov. 27, '36.) 32501, 32502.

IMPREGNATION OF METALS WITH SILICON.—G. R. Shepherd (Ihrig). 32494.

PRODUCTION OF OIL-SOLUBLE BISMUTH SALTS.—H. A. Shonle, and J. H. Waldo. 33271.

PREPARATION OF EXOTHERMIC SOLID COMBINATIONS from gaseous products.—Soc. des Produits Chimiques Saponifiés. (France, Dec. 15, '36.) 33034.

MANUFACTURE OF OXIDATION PRODUCTS.—Soc. of Chemical Industry in Basle. (Switzerland, April 28.) 32908, 32909, 32910.

DYEING, ETC., OF CELLULOSE ESTERS, ETC.—Soc. Rhodiaceta, and P. Audry. 32923.

CONVERSION OF MINERAL OILS INTO GASOLINE.—A. H. Stevens (Standard Oil Co., Indiana). 32719.

APPARATUS FOR IMPROVING THE POUR-POINT OF HYDROCARBON MIXTURES containing wax.—H. G. Tovote. (Germany, Dec. 1, '36.) 33011.

PYROLYTIC CONVERSION OF HYDROCARBON OILS.—Universal Oil Products Co. (United States, Nov. 30, '36.) 33129.

CONVERSION OF HYDROCARBONS.—Universal Oil Products Co. (United States, Aug. 21.) 33133.

COATINGS OF METALLIC ALLOYS ON LIGHT METALS, ETC.—H. Webb. 32489, 32490.

PRODUCTION OF ALUMINIUM COMPOUNDS, ETC.—Zwitterstocks-A.-G., P. A. F. Baumert, and E. Schiebold. 32728.

Specifications Open to Public Inspection

METHODS OF RETARDING THE DETERIORATION OF RUBBER and an improved rubber composition.—B. F. Goodrich Co. May 27, 1936. 32444/36.

METHODS OF PRODUCING WATERPROOF FABRICS permeable to air. Texilwerk Horn, A.-G. May 25, 1936. 34462/36.

MANUFACTURE OF SULPHUR DYESTUFFS.—I. G. Farbenindustrie. May 23, 1936. 10749/37.

PRODUCTION OF AMMONIA DERIVATIVES.—Rohm and Haas Co. May 28, 1936. 12669/37.

DERIVATIVES OF AROMATIC ORTHOHYDROXY CARBOXYLIC ACIDS.—Winthrop Chemical Co., Inc. May 29, 1936. 12,850/37.

PROCESS AND APPARATUS for the extraction of oil from fish-liver. Aktiebolaget Separator. May 23, 1936. 13269/37.

PROCESS FOR THE SAPONIFICATION OF CELLULOSE ESTERS.—Soc. Rhodiaceta. May 29, 1936. 13312/37.

PROCESS FOR THE SEPARATION AND/OR DEPOSITION OF METALS or metal compounds. W. H. Vale. May 29, 1936. 14234/37.

PROCESS OF MANUFACTURING PHENOL-ALDEHYDE RESINS or products thereof.—Dorch, Backsin, and Cos. Aktiebolag. May 26, 1936. 14290/37.

PROCESS OF TREATING PHENOL CONDENSATION PRODUCTS adapted for the manufacturing of phenol-aldehyde resins or products thereof.—Dorch, Backsin, and Cos. Aktie-Bolag. May 26, 1936. 14291/37.

TREATMENT OF CHLORINATED RUBBER and products thereof.—H. Michaelis. May 23, 1936. (Cognate Application, 14305/37.) 14304/37.

WATER-SOLUBLE ORGANIC IODINE COMPOUNDS.—Winthrop Chemical Co., Inc. May 29, 1936. 14390/37.

MANUFACTURE OF CARBOXYLIC ACID ESTERS of aromatic sulphodicarboxylic acids.—Soc. of Chemical Industry in Basle. May 23, 1936. 14379/37.

MANUFACTURE OF LACQUERS, films, plastic masses, and the like. Deutsche Hydrierwerke, A.-G. May 23, 1936. 14405/37.

PROCESS FOR THE PREPARATION of β-(*p*-oxyphenyl)-isopropylmethylamine.—Knoll, A.-G., Chemische Fabriken. May 26, 1936. 14592/37, 14593/37, 14595/37, 14597/37.

MANUFACTURE OF AMINOARYL SULPHONES.—Soc. of Chemical Industry in Basle. May 26, 1936. 14612/37.

MANUFACTURE OF SHAPED PRODUCTS from polyvinyl chloride.—I. G. Farbenindustrie. May 27, 1936. 14736/37.

PRODUCTION OF LAYERS OF THERMOPLASTIC HIGHLY VISCOUS PRODUCTS.—I. G. Farbenindustrie. May 28, 1936. 14856/37.

MANUFACTURE OF AZO-DYESTUFFS.—Durand and Huguenin, A.-G. May 28, 1936. 14857/37.

PREPARATION OF INTERMEDIATES and of dyestuffs derived therefrom.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. May 29, 1936. 14937/37.

PROCESS FOR THE MANUFACTURE OF STEROID COMPOUNDS.—Schering-Kahlbaum, A.-G. May 29, 1936. (Cognate Applications, 15034/37, 15035/37, 15036/37, 15037/37, 15038/37, 15039/37, 15040/37, 15041/37, and 15042/37.)

Specifications Accepted with Date of Application

PRODUCTION OF METAL faced with metal such as copper.—T. B. Chace. Feb. 14, 1935. 475,573.

OBTAINING COMPOUNDS OF KERATIN-SPLITTING PRODUCTS which are rich in heavy metal.—R. Von Wulfing, and E. Moller (trading as J. A. Wulfing (firm of)). Feb. 18, 1936. (Convention date not granted.) 475,574.

FUSING-TOGETHER OF GLASS and ceramic bodies.—Steatit-Magnesia, A.-G. Feb. 20, 1935. 475,575.

FROTH-FLOTATION CONCENTRATION OF MINERALS.—F. R. Tate. (Potash Co. of America). Feb. 20, 1936. 475,725.

DISTILLATION OF COAL and the consolidation of other materials by the application of heat.—T. M. Davidson. Feb. 22, 1936. (Cognate Applications 19238/36 and 5236/37.) 475,727.

FROTH-FLOTATION CONCENTRATION OF ORES.—F. B. Dehn (Potash Co. of America). Feb. 25, 1936. 475,789.

OBTAINING SULPHURIC ACID ESTERS FROM OILS, fats, their fatty acids or mixtures thereof.—H. W. K. Jennings (Chemische Fabrik Stockhausen and Cie). April 23, 1936. 475,792.

COATING MATERIALS WITH RUBBER.—G. W. Worrall, and Imperial Chemical Industries, Ltd. April 24, 1936. 475,737.

ELECTROLYTIC PROCESS and apparatus for descaling and/or cleaning metals.—J. F. Hinsley. May 23, 1936. 475,929.

MANUFACTURE OR USE OF AQUEOUS SOLUTIONS OF PHENOLS, their homologues, and derivatives.—Deutsche Hydrierwerke, A.-G. May 25, 1935. (Cognate Application, 14728/36.) 475,809.

PRODUCTION OF CHLORIDES OF METALS of the alkaline-earth and zinc series.—H. Browning. May 25, 1936. 475,930.

PRODUCING CLEAR AQUEOUS SOLUTIONS of animal, vegetable, or synthetic lipoids.—I. G. Farbenindustrie. May 24, 1935. 475,949.

COMPOUNDS OF THE ANTHRAQUINONE SERIES and their manufacture.—E. I. du Pont de Nemours and Co. May 24, 1935. 475,813.

DEGREASING APPARATUS.—Imperial Chemical Industries, Ltd. May 23, 1935. 475,814.

PURIFICATION OF SOLUTIONS OF ALKALI METAL HYDROXIDES.—H. M. Spittle and Imperial Chemical Industries, Ltd. May 26, 1936. 475,937.

MANUFACTURE OF AZO-DYESTUFFS.—W. H. Cliffe, and Imperial Chemical Industries, Ltd. May 26, 1936. 475,938.

MANUFACTURE AND PRODUCTION OF TRIMETHYLAMINE.—I. G. Farbenindustrie. May 27, 1936. (Addition to 435,200.) 475,818.

IMPREGNATION OF METALLIC CASTINGS and other metallic objects. H. Sutton, and L. F. Le Brocq. May 28, 1936. 475,889.

CHROMIUM STEELS.—Electro Metallurgical Co. June 8, 1935. (Addition to 397,646.) 475,895.

PROCESS FOR THE MANUFACTURE OF BARBITURIC ACID COMPOUNDS. A. Carpmael (I. G. Farbenindustrie.) May 29, 1936. 475,948.

DEHYDRATION OF OILS.—R. C. Sullivan. June 2, 1936. 475,663.

MANUFACTURE AND PRODUCTION OF PLASTIC MASSES.—G. W. Johnson (I. G. Farbenindustrie.) June 2, 1936. 475,822.

PRODUCTION OF SATURATED HYDROCARBONS, in particular of the gasoline range.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). June 16, 1936. 475,911.

MANUFACTURE AND PRODUCTION OF POLYMERISATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) June 16, 1936. 475,671.

MANUFACTURE AND PRODUCTION OF VAT DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) June 24, 1936. 475,913.

RUBBER-LIKE PRODUCT and method of making.—H. G. Kittredge. May 7, 1936. 475,598.

METHODS OF INCREASING THE RESISTANCE TO HEAT of alloys containing iron and aluminium with or without chromium.—Heraeus-Vacuumschmelze, A.-G. Sept. 24, 1935. 475,828.

MANUFACTURE OF SYNTHETIC-RESIN COMPOSITIONS.—Brush and General Mouldings Manufacturing Co., Ltd., M. B. Rousset, and A. V. Keller. Sept. 8, 1936. 475,686.

GALVANIC DEPOSITION OF COPPER from aqueous solutions of copper salts.—Galvanocor, A.-G. Sept. 13, 1935. 475,830.

EXTRACTION OF LIQUID MIXTURES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Oct. 26, 1935. 475,692.

PREPARATION OF CELLULOSE SUSPENSIONS and of cellulose xanthate solution.—Brown Co. Jan. 10, 1936. 475,925.

INTERMEDIATE PRODUCTS FOR DYESTUFFS.—Soc. of Chemical Industry in Basle. April 9, 1936. (Cognate Application, 10145/37.) 475,827.

REFINING OF HYDROCARBON OILS.—Edeleanu Ges. May 23, 1935. (Divided out of 14399/36.) 475,723.

PRODUCING PITCH by the distillation of tar.—P. Hilgenstock. June 17, 1937. 475,724.

Chemical and Allied Stocks and Shares

GENERAL conditions in the industrial and other sections of the Stock Exchange have remained steadier, but less activity was reported and the tendency was for prices to show sharper movements in price. The higher unemployment figures, although partly seasonal, affected sentiment, but, on the other hand, the better trend in metal and commodity prices was regarded as encouraging.

On balance most active shares of companies identified with the chemical and allied trades have moved further in favour of holders, although best prices were not held. United Molasses were a good feature on the full report and the interesting statements regarding the company's business made by the directors. Distillers were steady and are unchanged on the week at 104s. The latter company has a shareholding in United Molasses. Turner and Newall are better at 84s. 4½d. (compared with 83s. 9d.) on the good impression created by the results, but best prices were not maintained, while British Oxygen have reacted from 89s. 4½d. to 87s. 6d. at the time of writing.

Unilever were a better market and have recovered from 35s. to 36s.: it is expected that effect to the merger with Levers will be made shortly. Boots Pure Drug have been very steady and remained around 47s. British Drug Houses remained at 23s. 9d. at which quite a favourable yield is offered on the basis of last year's increased dividend of 6 per cent. Beechams Pills deferred shares have been active around 60s., awaiting the next interim dividend announcement, which is expected this month. B. Laporte were lower, business being recorded around 90s. Triplex Glass have declined 2s. to 52s. at the time of writing; as the company's prospects are regarded as mainly bound up with those of the motor car industry, the tendency is for the shares to move rather closely with those of motor manufacturing concerns. Imperial Smelting have maintained their improvement to 14s., assisted by the better price of zinc.

Associated Portland Cement are unchanged at 86s. 3d., aided by the general assumption in the market that there seem reasonable prospects of the dividend being kept at 22½ per cent. Alpha Cement shares and those of Tunnel Cement were steady, as these two companies are also expected in the market to maintain their distributions. British Plaster Board were much steadier than of late, but are little changed at 30s. 3d. It is being pointed out in the market that the gypsum deposits owned by the company are of considerable importance in permitting it to work on a low cost basis. Wall Paper Manufacturers deferred units have been in demand at better prices and have improved 6d. to 37s. 6d., it being pointed out that a good yield is offered. Last year's dividend was 12½ per cent., and this was covered by a large margin of profits. Demand was in evidence for Borax Consolidated on which the market remains hopeful a larger dividend will be paid for the year ended September last, and the price has improved further from 27s. 9d. to 28s. 3d.

Fison, Packard and Prentice received more attention and are 1s. 3d. higher at 36s. 3d. It is realised that earnings of the latter company are likely to benefit more fully in future from the expansion of the business. Cooper, McDougall and Robertson were again 32s. 6d., and British Match at 36s., are within 3d. of the price ruling a week ago. General Refractories were another active feature, the price having recovered further from 21s. to 22s. 6d. Pinchin Johnson were good with a rise from 37s. 9d. to 39s. British Aluminium were higher at 46s. 6d., compared with 45s.

Elsewhere, iron and steel shares did not keep best prices, but Dorman Long are 1s. higher on balance at 35s. 9d., aided by annual meeting considerations. Consett Iron were also better at 11s. 4½d. assisted by the recent news that the company has blown in another blast furnace. Babcock and Wilcox were higher at 44s. 6d. Oil shares were steadier, it being felt that the decision of the leading oil companies to increase the profit margin of retailers indicates confidence in prospects and suggests that an early reduction in the price of petrol is unlikely.

New Companies Registered

John McNicol and Son, Ltd. (334,165).—Nominal capital £300. Manufacturing chemists, etc. Directors: John McNicol, and John McNicol, junior, both of 31 Lingwood Gardens, Isleworth, Middlesex. Registered office: 139 Staines Road, Hounslow, Middlesex.

Robinson Bindley Processes (1937), Ltd. (333,558).—Private company. Capital £100 in 2,000 shares of 1s. each. To carry on the business of chemical manufacturers and engineers, etc. Subscribers: Claude W. Murphy, "Westwood," Harold Park, Romford, Essex; Cecil A. Sherman, 30 Baskerville Road, S.W.18. Solicitors: Dawson & Co., 2 New Square, W.C.2.

Hillman Products (Bridgwater), Ltd. (333,814).—Private company. Capital £100 in 100 shares of £1 each. To carry on business as manufacturers of and dealers in polishes, cleaners, enamels, paints, varnishes, etc. Directors: Arthur T. Emery, The Grove, Burnham-on-Sea; Alfred G. Hillman, Damory, Wembdon Hill, Bridgwater; John T. C. Hillman.

Lambelle, Ltd. (333,629).—Private company. Capital £500 in 5,000 shares of 2s. each. To carry on business as manufacturers and distillers of and dealers in perfumes and essences, soaps, salves, ointments, etc. Directors: Ralph R. Wilkins (chairman), 38 Station Road, Redhill; Andrew S. Milne, "Cecils," Chigwell, Essex. Registered office: 40 Station Road, Redhill, Surrey.

Stanley Noott, Ltd. (333,981).—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on the business of pharmaceutical chemists and druggists, drysalters, oil and colourmen, etc. Directors: Stanley A. Noott, Perry Park Road, Blackheath, Staffs; Alfred Pittaway, The Hayes, Blackheath, Staffs. Registered office: 160 High Street, Blackheath, Staffs.

Bury "Chrome" Plating Co., Ltd. (333,657).—Private company. Capital £1,500 in 1,500 shares of £1 each. To carry on business as electro, nickel and chromium platers, bronzers, oxidisers and metal platers generally, etc. Directors: Herbert Wheat and Joseph Wheat, "Alby," Crescent Road, Hale, Ches.; Chas. R. Bee and Chas. Bee, Lansdowne Villa, South Grove, Sale, Ches.

Bryer Soldering Fluid, Ltd. (333,803)\—Private company. Capital £100 in 100 shares of £1 each. To carry on the business of manufacturers of and dealers in soldering fluids and fluxes, drysaltery, chemicals, etc. Directors: Ernest Newton, Wych Elm, Birmingham Road, Wylde Green; Horace Newton, Graylands, 888 Chester Road, Erdington. Registered Office: 61 Slaney Street, Birmingham.

F. Godfrey and Sons, Ltd. (334,154).—Capital £3,000. To acquire the business of bleachers and dyers of straw and plaits and other fibrous substances carried on by A. F. Godfrey and F. E. Godfrey, at Langley Street, Luton, as "F. E. Godfrey and Sons." Permanent directors: Aubrey F. Godfrey, and Fredk. E. Godfrey, both of Dyeworks, Langley Street, Luton, bleachers and dyers and plait and felt merchants.

Frank Woodward, Ltd. (333,335).—Private company. Capital £750 in 750 shares of £1 each. To carry on the business of manufacturers and refiners of oils and fats, chemists, drysalters, etc. Directors: Frank Woodward, 41 The Gardens, West Harrow; Herbert E. Ridler, 53 Dorset Drive, Edgware. Solicitors: Ashby, Rogers and Fournier, 105 Newington Causeway, S.E.1. Registered Office: 27 Cranbourne Parade, Mutton Lane, Potters Bar.

Organic Glass, Ltd. (333,677).—Private company. Capital £100 in 100 ordinary shares of £1 each. To carry on the business of manufacturers of synthetic resins, resinous moulding powders, varnishes and coatings, transparent resins, resinous, cellulosic or composite glass substitutes, safety or laminated glass, etc. Directors: Julian P. Fraser, "Ravensbrook," Oxted, Surrey; Henry Barnett, 513 Clive Court, Maida Vale, W.9. Registered office: "Royal London House," 17 Finsbury Square, E.C.2.

Wessex Metal and Chemical Company, Ltd. (333,228).—Private company. Capital £6,000 in 2,000 6 per cent. non-cumulative preference and 4,000 ordinary shares of £1 each. To acquire the business of a manufacturer of and dealer in metals, chemicals, pigments and paint heretofore carried on by Percy H. Jewell. Directors: Percy H. Jewell, Church Street, Warminster, Wilts.; Chas. A. Andrews, 61 Park Grove, Henleaze, Bristol; Samuel Sainsbury, Midford Lane, Limpley Stoke; and Lynton, Beck. Solicitors: Sylvester and Mackett, Trowbridge, Wilts. Registered Office: Church Street, Westbury, Wilts.

Peroxide Development, Ltd.—Registered as a "private" company. Nominal capital, £1,000 in 1,000 shares of £1 each. To carry out research work and conduct experiments with a view to the development of new methods in the application of peroxide and allied chemical products; to carry on the business of manufacturers of and dealers in peroxides, dyes, dyestuffs, chemicals, varnishes, colours, industrial, pharmaceutical and other preparations, etc. Subscribers: John G. Beevor and Charles H. Priestley, 18 Austin Friars, E.C. Solicitors: Slaughter and May, 18 Austin Friars, E.C.

Our Chemists, Ltd. (334,377).—Private company. Capital £100 in 100 shares of £1 each. To carry on the business of dealers in chemicals, gases, drugs, medicines, etc. Directors: Georganna Edwards, 6 The Parade, Mitcham Road, Croydon; Hilda G. Edwards.

Tamar Indien Grillon, Ltd. (326,003).—The nominal capital has been increased by the addition of £960 beyond the registered capital of £120. The additional capital is divided into 2,320 ordinary shares of 5s. The 120 ordinary shares of £1 in the original capital have been subdivided into 480 ordinary shares of 5s.

Nova Chemicals, Ltd. (334,119).—Private company. Capital £5,000 in 5,000 shares of £1 each. To carry on the business of manufacturers of and dealers in chemicals, gases, drugs, oils, medicines, etc. The subscribers are:—Bruce Littlejohn, 26 Cutcombe Road, S.E.5; Albert Mitchell, 69 Temple Avenue, Dagenham. Registered Office: 75b Queen Victoria Street, E.C.4.

Amanda Products, Ltd. (334,211).—Capital £2,000 in £1 shares. To carry on the business of manufacturers of and dealers in perfumes, essences and toilet soaps, natural flower products, synthetic and aromatic chemicals and compounds, etc. The subscribers are:—Geo. E. Mellor, 4 Greenemoor Avenue, Higher Openshaw, Manchester, 11; Geo. A. Neaves, 38 Fountain Street, Manchester, incorporated accountant.

F. Gutkind and Company, Ltd. (334,102).—Private company. Capital £1,000 in 1,000 ordinary shares of £1 each. To carry on the business of distillers, rectifiers, importers and exporters of and dealers in essential oils, perfumes, essences and preparations, chemists, druggists, etc. The subscribers are:—Arthur Vandyk, 1 and 2 Finsbury Square, E.C.2, solicitor; Frederick T. Smith. Registered Office: 1 and 2 Finsbury Square, E.C.2.

Martolia, Ltd. (334,245).—Capital £1,000 in 1,000 shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in chemical or other substances connected with the preparation, cleaning, dyeing and finishing of linens, woollens, cottons, silks, yarns, worsted and kindred materials, textiles and fabrics, etc. The subscribers are:—Jas A. Ayres, 136 Palmerston Road, N.22, company director; Alexander Wright, 87 Manor Drive, Wembley Park, incorporated accountant.

Gelatin Products, Ltd. (334,106).—Private company. Capital £10,000 in 10,000 ordinary shares of £1 each. To carry on the business of manufacturers and suppliers of and dealers in gelatin products of all kinds, including containers, wrappers or capsules, whether composed wholly or partly of gelatin or not; manufacturers and sellers of medicines and preparations, etc. The subscribers are:—C. H. Scott, 18 Austin Friars, E.C.2; R. H. R. McGill; F. W. Edmonds.

Forthcoming Events

London.

December 13.—Institution of the Rubber Industry. Royal Empire Society, Northumberland Avenue, W.C.2. 7.30 p.m. W. S. Davey and F. J. Coker, "The Preparation of Latex and Determination of Quality."

Royal Society of Arts. John Street, Adelphi, W.C.2. 8 p.m. Professor J. C. Drummond "Historical Studies of English Diet and Nutrition."

December 14.—Pharmaceutical Society, 17 Bloomsbury Square, W.C.1. 8.30 p.m. F. Wokes, "Biochemistry and Pharmacy."

December 15.—Electrodepositors' Technical Society. Northampton Polytechnic Institute, St. John Street, Clerkenwell, E.C.1. 8.15 p.m. S. Wernick, "Theory and Practice in Electrodeposition."

December 16.—The Chemical Society, Burlington House, W.1. Ordinary Scientific meeting.

December 17.—Institution of Chemical Engineers. Institution of Civil Engineers, Gt. George Street, S.W.1. 6.30 p.m. Dr. R. E. Slade, "The Development of Grass Drying."

Birmingham.

December 15.—Institute of Chemistry (Birmingham and Midland Section). J. Ivon Graham, "The Work of the Mining Research Laboratory."

Derby.

December 14.—British Association of Chemists. Cavendish Cafe, Corn Market. Debate: "That the Chemist's Training is inadequate for his job."

Falkirk.

December 20.—Institute of Vitreous Enamellers. Joint Meeting with the Falkirk branch of the Institute of British Foundrymen. Temperance Cafe. 7.30 p.m. Professor Hay and colleagues, "Physical Properties of Enamels."

Manchester.

December 15.—Society of Glass Technology. Municipal College of Technology, Sackville Street, 2 p.m. 189th Ordinary General Meeting.

Weekly Prices of British Chemical Products

WITH the approach of the end of the year period a quiet tone prevails in most sections of the market. So far as heavy chemicals are concerned interest is mainly displayed in the renewal of forward contracts covering deliveries over the next twelve months. In some cases dearer prices are causing buyers to hesitate before placing their forward requirements, but on the whole the volume of forward buying shows further expansion. An advance of £1 per ton in the quotations for ammonium chloride has been notified as from December 8. There are no important changes to record in other directions and values in nearly all sections of the market are on a firm basis. One or two small price adjustments are possible before the end of the year, but in the main present quotations are expected to remain stable. There are no changes on the week in the quotations for coal tar products and the volume of business has been decidedly small, the market, however, displays a confident tone and prices, if anything, are inclined to have a harder tendency.

MANCHESTER.—Increasing activity has been in evidence on the Manchester chemical market during the past week, the business transacted being mainly in connection with contracts covering deliveries over the first six months of next year. For the most part values of heavy products are firm in tendency and only in odd cases is there any sign of easiness. Users of chemicals for the textile bleaching, dyeing and finishing trades are pretty well covered for supplies, though some traders report a contraction in the quantities that are moving into actual consumption. In the market for the by-products the tone in several sections continues easy, although not much further actual weakness has to be reported.

GLASGOW.—The demand for general chemicals has been slow during the week, without special feature to report.

Price Changes

Rises: Ammonium Chloride; Lead Acetate (Manchester); Salammoniac; Sodium Prussiate (Manchester); Carbolic Acid.

Falls: Potassium Chlorate (Manchester); Carbolic Acid (Manchester); Pitch (Manchester); Lead Acetate (Scotland).

General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech. 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £18 10s. per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d. station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9¼d. per lb., less 2½%; d/d U.K.

CHROMIUM OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £18 15s. per ton f.o.b. SCOTLAND: £20 10s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£22 10s. per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots) Dark, 50% by volume, £21 10s.; by weight, £27 10s.; Pale, 50% by volume, £27; by weight, £32 per ton. LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £31 10s.; brown, £1 per ton less. MANCHESTER: White, £35 10s.; brown, £34 10s.

LEAD NITRATE.—£34 per ton for 1-ton lots.

LEAD, RED.—£32 15s. 0d., 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £32 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £32 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—80° Tw. spot, £16 10s. per ton makers' works.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s. to £36 15s. per ton for 2-ton lots ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 10s. per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 1s.

POTASSIUM PRUSSIATE.—6¼d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d.

SALAMMONIAC.—Dog-tooth crystals, £36 per ton, fine white crystals, £17 10s. per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 to £3 10s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £17 15s. per ton net ex store.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE MONOHYDRATE.—£15 5s. per ton d/d in minimum ton lots in 2 cwt. free bags
SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.
SODIUM CHROMATE.—4¼d. per lb. d/d U.K.
SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts. MANCHESTER: 4d. per lb. GLASGOW: 4d. net, carriage paid.
SODIUM HYPOSULPHITE.—Pea crystals, £14 10s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered per ton lots.
SODIUM PRUSSIATE.—½d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5d.
SODIUM SILICATE.—£9 10s. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d sta- of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.
WHITE SUGAR OF LEAD.—£31 10s. per ton net.
ZINC SULPHATE.—Tech., £12 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—7s. 6d. to 7s. 9d. per lb.
CARBON BLACK.—4¾d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 10½d. to 11d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5½d. per lb.; dark 4d. to 4½d. per lb.
LAMP BLACK.—£28 to £30 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—30%, £16 10s. to £17 5s. per ton.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.
NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1938.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d.
CARBOLIC ACID.—Crystals, 7¾d. to 9d. per lb., small quantities would be dearer; Crude, 60's, 4s. to 4s. 3d., dehydrated, 4s. 6d. to 4s. 9d. per gal. MANCHESTER: Crystals, 9½d. per lb. f.o.b. in drums; crude, 4s. 2d. per gal. GLASGOW: Crude, 60's, 4s. 3d. to 4s. 6d. per gal.; distilled, 60's.
CREOSOTE.—Home trade, 6¼d. to 6⅝d. per gal., f.o.r. makers' works; exports, 6⅜d. to 6½d. per gal., according to grade. MANCHESTER: 5½d. to 6¼d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5⅜d. to 6¼d.
CRESYLIC ACID.—97/99%, 4s. 1d. to 4s. 6d.; 99/100%, 4s. 6d. to 5s. 6d. per gal., according to specification; Pale, 99/100%, 4s. 6d. to 4s. 10d.; Dark, 95%, 3s. 9d. to 4s. 2d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 4s. 3d. to 4s. 6d. MANCHESTER: Pale, 99/100%, 4s. 2d.
NAPHTHA.—Solvent, 90/160, 1s. 6½d. to 1s. 7½d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £8 to £9 per ton; purified crystals, £18 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 10s. to £7 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £18 10s. per ton f.o.b.
PITCH.—Medium, soft, 36s. to 38s. per ton, f.o.b. MANCHESTER: 36s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.
PYRIDINE.—90/140%, 12s. to 14s. 9d. per gal.; 90/160%, 11s. to 12s. 6d. per gal.; 90/180%, 3s. 3d. to 3s. 6d. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 12s. 6d. to 14s. per gal.
TOLUOL.—90%, 1s. 10½d. per gal.; pure, 2s. 3½d. to 2s. 4½d. GLASGOW: 90% 120, 1s. 10d. to 2s. 1d. per gal.
XYLOL.—Commercial, 2s. 2½d. per gal.; pure, 2s. 4½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 15s. to £8 5s. per ton; grey, £10 to £11. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.
METHYL ACETONE.—40-50%, £40 to £42 per ton.
WOOD CREOSOTE.—Unrefined 6d. to 9d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.—2s. 8d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
WOOD TAR.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 5d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 9½d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 10d.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works
GAMMA ACID.—Spot, 4s. per lb. 100% d/d buyer's works.
H ACID.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
NAPHTHIONIC ACID.—1s. 8d. per lb
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—9¼d. to 9⅝d. per lb.; flake, 9½d. to 9¾d.
α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d. in casks.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. per lb. 100%.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9½d. to 10d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10-cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Company News

Power-Gas Corporation, Ltd., in their report for the year ended September 30 show a balance of £31,356 (£23,600); reserve fund, £6,270 (£4,700); add balance brought forward, £13,044, making £38,130; dividend of 8 per cent., less tax (6 per cent.); £14,130 forward.

Tate and Lyle, Ltd., sugar importers and refiners, show net profits for the year ended September 30 last, amounting to £1,227,553, compared with £1,226,841 for the preceding year. The dividend is maintained at 18¼ per cent., and £300,000, against £284,000 is placed to reserve. Last year a further £316,000 was transferred from investment reserve direct to general reserve. The carry-forward is £12,647 down at £46,227.

Dorman, Long and Co., Ltd., in their full report for 1936-37 show that trading profits are up from £989,787 to £1,249,749, and, including dividends from subsidiary and associated undertakings, total income amounts to £1,396,701, compared with £1,128,916 last year. The dividend on the increased ordinary capital is stepped up from 6 per cent. to 10 per cent., and consequently the preferred shareholders receive 18 per cent., against 14 per cent. The carry-forward is increased by £9,163 to £152,130.

L. B. Holliday and Co., Ltd., in their report for the year ended June, 30, 1937, state that net trading profit, after allowing for depreciation and directors' remuneration, amounted to £31,927; deduct interest on debenture stock for year £11,195, and transfer to debenture redemption sinking fund £2,500, leaving £18,232; add brought forward £68,052, making £86,284. Directors recommend a dividend of 3½ per cent. (less tax) for year, absorbing (net) £8,446, carrying forward £77,838.

The Bradford Dyers' Association, Ltd., have decided to pay the interest on the 4 per cent. debenture stock, as usual, on January 1, next, and to postpone payment of the dividend on the 5 per cent. cumulative preference stock for the six months ending December 31. Arrears of dividend on the preference stock date from January 1, 1933. The last dividend to be paid on the ordinary stock was 4.167 per cent., less tax, for the year ended December 31, 1930.

Griffiths Hughes Proprietaries, Ltd., which owns the whole of the issued capital of E. Griffiths Hughes, Ltd., proprietors of Kruschen salts, etc., have reduced the interim dividend on the ordinary shares to 2½ per cent. actual, less tax, payable on December 31. This dividend, however, is in respect of a period of nine months to March 31, 1938, as the directors have decided to change the end of the financial year of the company from June 30 to March 31 to coincide with the financial year of the operating company.

Ilford, Ltd., manufacturers of photographic plates and films, which recently raised its dividend by 1 per cent., earned considerably increased profits for the year to end October last. After providing an unspecified amount for depreciation and contingencies, etc., profits amount to £138,337—an increase of £26,404. The amount earned for dividend is £135,175, compared with £83,630, the latter figure being struck after providing £25,000 for writing off investments in subsidiaries. The ordinary dividend is stepped up from 7 per cent. to 8 per cent. A transfer of £25,000 against nil, is made to reserve, and, in addition, £25,000 is allocated to a special reserve for doubtful debts and foreign currencies, etc., leaving carry-forward slightly higher at £21,801.

The United Molasses Co., Ltd., in their full accounts now available show that trading profit in the year to September 30, 1937, rose from £716,186 to £1,014,054. Dividends from subsidiaries increased from £62,025 to £90,168, while other income totalled £35,061 compared with £53,375, giving a total revenue of £1,139,283, or £307,697 more than in 1935-1936. Net profit was £628,140 against £399,068. Consolidated profits of the company and its subsidiaries, after providing for directors' fees, management expenses, full taxation on the year's profits, and all other charges, amounted to £946,241, an increase of £187,197 on the 1935-36 figure of £759,044. **The ordinary dividend is raised from** 14 per cent to 21¼ per cent., the final being 15 per cent., less tax. General reserve is credited with £225,000, against £110,000 in 1935-36, and £37,000 compared with £20,000, is placed to superannuation funds. These allocations leave a balance of £49,634 to go forward, against £49,480 brought in.

The South Durham Steel and Iron Co., Ltd., for the year to September 30 last, show a substantial expansion, as indicated by the increased dividends on the ordinary and "B" ordinary shares. Total profits, which include a dividend to be declared by a subsidiary, are £41,071 higher, at £258,343. The depreciation allowance is increased from £85,000 to £110,000, and debenture interest takes £38,997, compared with £14,754. The amount earned for dividend, after allowing £3,456 against £2,251 for other charges, is thus down from £97,267 to £87,890. Dividends on the ordinary and "B" ordinary—which are stepped up from 12 per cent. and 6 per cent. to 13 per cent. and 7 per cent. respectively—take £86,647, against £77,269. The carry-forward is raised from £119,013 to £120,256. Last year the carry-forward was £119,013, against £118,455, after providing £19,440 for debenture issue expenses.

British Borneo Petroleum Syndicate have announced an interim of 5 per cent. (3s. 6d. per share), less tax (same), payable December 29.

British Tar Products, Ltd., announce a final dividend on preferred ordinary and ordinary of 3¾ per cent., making 10 per cent. for year (same), plus bonus of 5 per cent. on both classes (same), all less tax.

The Sulphide Corporation, in their report for the year to June 30, 1937, shows that trading profit amounted to £156,279—an increase of £73,981 on the previous year. Interest, etc., totals £14,935, against £12,039, making a total of £171,214. Last year there was a profit of £5,584 on sale of investments and an exchange credit of £64. Net profit, after fees, expenses, etc., rose from £91,068 to £161,177. The ordinary dividend is doubled at 10 per cent.

Boots Pure Drug Co., Ltd., announce a dividend of 6 per cent., less tax, for the quarter ending December 31, payable to shareholders registered December 10. This amount is the same as for the corresponding quarter of last year. Two quarterly dividends of 6 per cent., less tax, have already been paid on account of the year ending March 31, 1938. For many years past the total dividend has been 24 per cent., less tax, together with a bonus of 5 per cent., tax free. The present dividend will be paid on December 31.

Turner and Newall, Ltd., makers of asbestos products, announced that for the year to September 30, 1937, record profits were earned, and the ordinary dividend, which is payable on a bigger capital, is raised by 2½ per cent., to 20 per cent., less tax. After providing for depreciation, directors' fees and income tax, profits come out at the peak level of £1,333,489—an increase of £170,181 on the previous year's figure of £1,163,308. A provision of £10,000 is again made for the staff pension fund, and £40,000 is allowed for the estimated N.D.C. liability for the half-year to September 30, 1937. The preference dividend takes £101,098, leaving the amount earned for ordinary dividend up from £1,052,210 to £1,182,391. The final dividend on the ordinary stock is 16¼ per cent., less tax at 4s. 6d., payable on January 22. This makes a total of 20 per cent. payable on a capital of £5,328,320, against 17½ per cent. in the previous year, which was paid on a capital of £4,843,933.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

INDEPENDENT PHARMACISTS' SUPPLIES, LTD., London, W.C. (M., 11/12/37.) Nov. 26, debenture to Dr. W. H. Parkinson, Nottingham, securing £185 and further sums not ex. therewith £378 9s. 9d., which the holder may be called upon to pay under a guarantee; charged on certain book debts, etc. *Nil. December 31, 1936.

Satisfactions

LA BARRE, LTD., Wolverhampton, enamel manufacturers. (M.S., 11/12/37.) Satisfaction, November 24, of debentures registered March 30, 1931, to extent of £500.

MOULDED RUBBER PRODUCTS, LTD., Luton. (M.S., 11/12/37.) Satisfaction, November 29, £2,000, registered November 20, 1936.

Bankruptcy Proceedings

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

MARLEY HILL CHEMICAL COMPANY, LTD.—Notice is given that a general meeting of the members of the above-named company will be held at 31 Mosley Street, Newcastle-upon-Tyne, on Friday, the 7th day of January, 1938, at 12 noon, for the purpose of having an account laid before them showing the manner in which the winding-up has been conducted and the property of the Company disposed of.